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SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V
EPA CONTRACT NO.: 68HE0319D0004

October 16, 2019

Mr. Eric Daly, On-Scene Coordinator
U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT No: 68HE0319D0004
TD No: TO-0032-0040
DC No: STARTV-01-D-0084
SUBJECT: SITE-SPECIFIC UFP QUALITY ASSURANCE PROJECT PLAN
738 UPPER MOUNTAIN ROAD SITE
LEWISTON, NIAGARA COUNTY, NEW YORK

Dear Mr. Daly,

Enclosed please find the Site-Specific Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP) for the Removal Assessment activities to be conducted by the U.S. Environmental Protection Agency, Region II (EPA) with the support of Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) at the 738 Upper Mountain Road Site located in Lewiston, Niagara County, New York. This plan covers the soil sampling activities to be performed at off-site vendor facilities and on-site beginning on October 21, 2019.

If you have any questions or comments, please do not hesitate to contact me at (908) 565-2980.

Sincerely,

WESTON SOLUTIONS, INC.

Bernard Nwosu
START V Site Project Manager

Enclosure:

cc: TD File: TO-0032-0040

SITE-SPECIFIC UFP QUALITY ASSURANCE PROJECT PLAN

738 UPPER MOUNTAIN ROAD SITE

Lewiston, Niagara County, New York

Site Code: A23N
CERCLIS Code: NYN000206697

Prepared by:

Superfund Technical Assessment & Response Team V
Weston Solutions, Inc.
Federal East Division
Edison, New Jersey 08837

Prepared for:

U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
Edison, New Jersey 08837

DC No: STARTV-01-D-0084
TD No: TO-0032-0040
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October 2019

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF ACRONYMS

ADR	Automated Data Review
ANSETS	Analytical Services Tracking System
AOC	Acknowledgment of Completion
ASTM	American Society for Testing and Materials
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
CFM	Contract Financial Manager
CO	Contract Officer
COI	Conflict of Interest
COO	Chief Operations Officer
CRDL	Contract Required Detection Limit
CRTL	Core Response Team Leader
CRQL	Contract Required Quantitation Limit
CQLOSS	Corporate Quality Leadership and Operations Support Services
CWA	Clean Water Act
DCN	Document Control Number
DI	Deionized Water
DPO	Deputy Project Officer
DQI	Data Quality Indicator
DQO	Data Quality Objective
EM	Equipment Manager
EDD	Electronic Data deliverable
ENVL	Environmental Unit Leader
EPA	Environmental Protection Agency
ERT	Environmental Response Team
FASTAC	Field and Analytical Services Teaming Advisory Committee
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/MS	Gas Chromatography/Mass Spectrometry
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSO	Health and Safety Officer
ITM	Information Technology Manager
LEL	Lower Explosive Limit
LSASD	Laboratory Services and Applied Science Division
MSA	Mine Safety Appliances
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS (Concluded)

OSWER	Office of Solid Waste and Emergency Response
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PIO	Public Information Officer
PM	Program Manager
PO	Project Officer
PRP	Potentially Responsible Party
PT	Proficiency Testing
QA	Quality Assurance
QAL	Quality Assurance Leader
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RC	Readiness Coordinator
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
RSCC	Regional Sample Control Coordinator
RST	Removal Support Team
SARA	Superfund Amendments and Reauthorization Act
SEDD	Staged Electronic Data Deliverable
SOP	Standard Operating Practice
SOW	Statement of Work
SPM	Site Project Manager
START	Superfund Technical Assessment & Response Team
STR	Sampling Trip Report
TAL	Target Analyte List
TCL	Total Compound List
TD	Technical Direction Document
TDL	Technical Direction Letter
TO	Task Order
TQM	Total Quality Management
TSCA	Toxic Substances Control Act
UFP	Uniform Federal Policy
VOA	Volatile Organic Analysis

TABLE 1: Crosswalk

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
A. Project Management and Objectives			
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7, & 8	Personnel Qualifications and Sign-Off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certifications
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model (CSM)	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP ELEMENTS FOR EVALUATING EXISTING DATA
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
B. Measurement/Data Acquisition			
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field Quality Control (QC) Sample Summary	2.3.5	QC Requirements
21	Field Standard Operating Procedures (SOPs)	2.3.2	Sampling Procedures and Requirements

TABLE 1: Crosswalk (Concluded)

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
B. Measurement/Data Acquisition			
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical QC and Corrective Action	2.3.5	QC Requirements
29	Project Documents and Records	2.2.8	Document and Records Requirements
C. Assessment/Oversight			
31, 32, & 33	Assessments and Corrective Action	2.4	ASSESSMENTS AND DATA REVIEW (CHECK)
		2.5.5	Reports to Management
D. Data Review			
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #1& 2: Title and Approval Page

1. Project Identifying Information

a) Site Name/Project Name: 738 Upper Mountain Road Site

b) Site Location/No.: Lewiston, Niagara County, New York / NYN000206697

c) Contract/Work Assignment No.: 68HE0319D0004 / TDD#: 0032-0040

2. Lead Organization

Weston Solutions, Inc.
1090 King Georges Post Road, Suite 201
Edison, New Jersey 08837

Lead Organization's Site Project Manager:

Bernard Nwosu	Bernard Nwosu	10/16/19
Printed Name/Title	Signature	Date

Lead Organization's Technical Review:

Bernard Nwosu	Bernard Nwosu	10/16/19
Printed Name/Title	Signature	Date

Lead Organization's QA/QC Chemist:

Smita Sumbaly	Smita Sumbaly	10/16/19
Printed Name/Title	Signature	Date

EPA Region II On-Scene Coordinator:

Eric Daly	Eric M. Daly	10-17-2019
Printed Name/Title	Signature	Date

EPA Region II Quality Assurance Officer:

Printed Name/Title	Signature	Date

Document Control Number: START V-01-D-0084

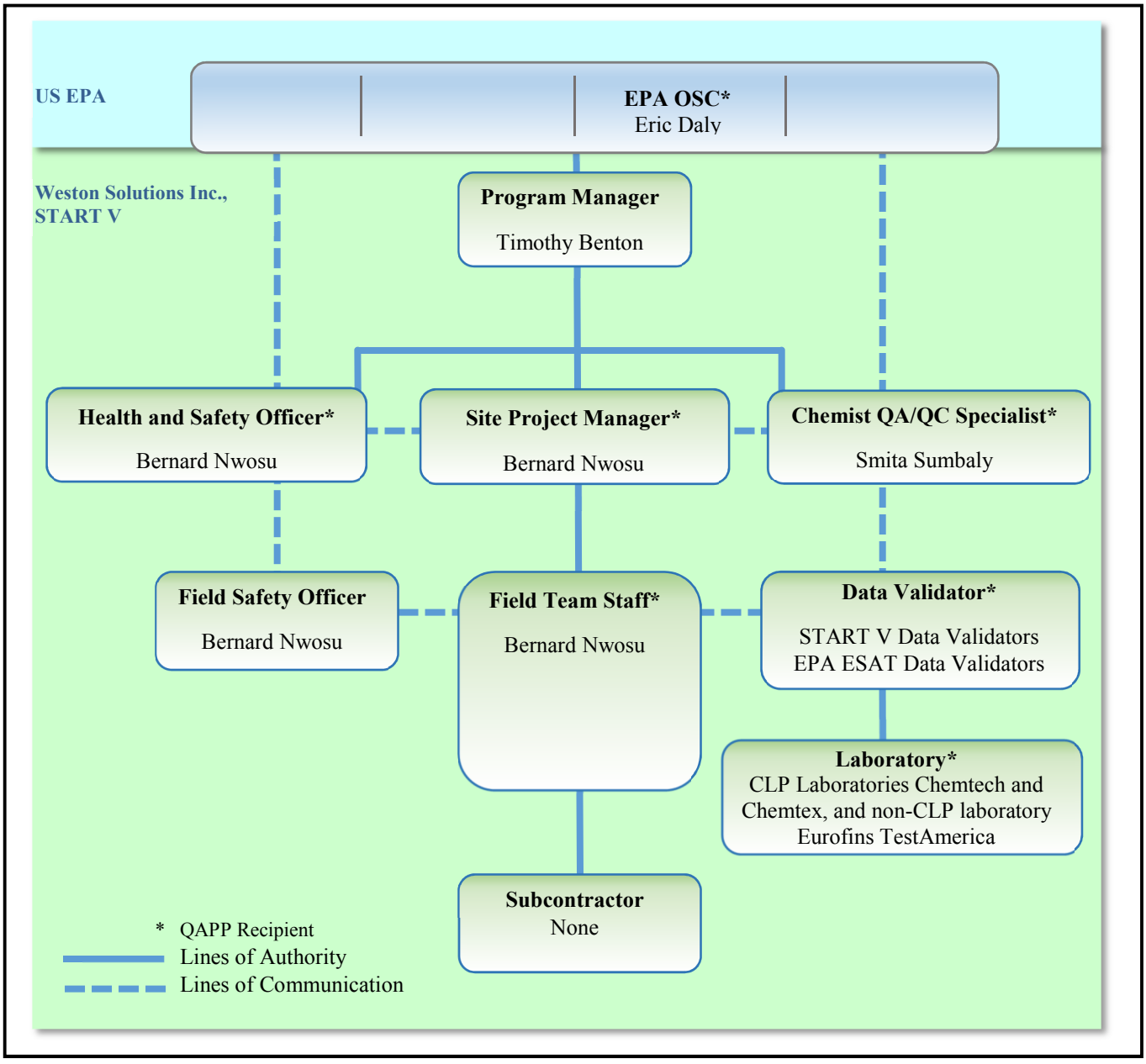
QAPP Worksheet #1& 2: Title and Approval Page (Concluded)

3. List plans and reports from previous investigation relevant to this project.

Site-Specific UFP Quality Assurance Project Plan, Upper Mountain Road Site (DC No: RST3-03-D-0102)

Exclusions:
Not Applicable.

QAPP Worksheet #3 & 5: Project Organizational and QAPP Distribution



Acronyms:
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
QA/QC – Quality Assurance/Quality Control
START V – Superfund Technical Assessment & Response Team V
ESAT – Environmental Services Assessment Team
CRT – Core Response Team
CLP – Contract Laboratory Program
QAPP – Quality Assurance Project Plan

QAPP Worksheet #3 & 5: Project Organizational and QAPP Distribution (Concluded)

QAPP Recipient	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Eric Daly	OSC	EPA, Region II	(732)-321-4350	(732) 906-6920	Daly.Eric@epa.epamail.gov	STARTV-01-D-0084
Bernard Nwosu	HSO/SPM	Weston Solutions, Inc., START V	(908)-565-2980	Not Applicable	Ben.Nwosu@westonsolutions.com	STARTV-01-D-0084
Smita Sumbaly	QAO	Weston Solutions, Inc., START V	(732) 585-4410	Not Applicable	S.Sumbaly@westonsolutions.com	STARTV-01-D-0084
Site TD File	START V Site TDD File	Weston Solutions, Inc., START V	Not Applicable	Not Applicable	Not Applicable	STARTV-01-D-0084

QAPP – Quality Assurance Project Plan
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
SPM – Site Project Manager
START V – Superfund Technical Assessment & Response Team V
CRT – Core Response Team
QAO – Quality Assurance Officer
HSO – Health & Safety Officer
TD – Technical Direction
NA – Not applicable

QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates[1]	Date of Training
[Specify location of training records and certificates for samplers]							
QAPP Training	This training is presented to all START V personnel to introduce the provisions, requirements, and responsibilities detailed in the UFP QAPP. The training presents the relationship between the site-specific QAPPs, SOPs, work plans, and the Generic QAPP. QAPP refresher training will be presented to all employees following a major QAPP revision.	Weston Solutions, Inc., (In House Training)	As needed	All START V field personnel upon initial employment and as refresher training	Weston Solutions, Inc.	Within Division	February 2019
Health & Safety Training	Health and safety training will be provided to ensure compliance with Occupational Safety and Health Administration (OSHA) as established in 29 CFR 1910.120.	Weston Solutions, Inc., (In House Training)	Yearly at a minimum	All Employees upon initial employment and as refresher training every year	Weston Solutions, Inc.	Within Division	February 2019
Others	Scribe, ICS 100 and 200, and Air Monitoring Equipment Trainings provided to all employees	EPA ERT (In-House Training) FEMA (On-line Training) Weston Solutions, Inc., (In House training)	Upon initial employment and as needed				February 2019
	Dangerous Goods Shipping	Weston Solutions, Inc., (In House Training)	Every 3 years				April 2019

All team members are trained in the concepts and procedures in recognizing opportunities for continual improvement, and the approaches required to improve procedures while maintaining conformance with legal, technical, and contractual obligations.

[1]All members, including subcontractors, certifications are in possession of Health & Safety Officer.

QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet

Organization: Weston Solutions, Inc., START V

Name*	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Bernard Nwosu	HSO/SPM, START V	25 years	Implementing and executing the technical, QA and health and safety during sampling event, sample collection and sample management. Health and Safety Officer	Weston Solutions, Inc., START V		10/16/19
Smita Sumbaly	QAO, START V	30 years	Chemist QA/QC Specialist	Weston Solutions, Inc., START V		10/16/19

*All START V members, including subcontractor's resumes are in possession of Program Manager, EPA Project Officer, and Contracting officers
SPM – Site Project Manager
START V – Superfund Technical Assessment & Response Team V
QAO – Quality Assurance Officer
HSO – Health & Safety Officer
QA/QC – Quality Assurance/Quality Control

Organization: EPA Region II

Name	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Eric Daly	EPA OSC	NA	All project coordination, direction and decision making.	EPA, Region II		10/17/19

EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator

QAPP Worksheet #6: Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Point of contact with EPA OSC	SPM, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic)
Adjustments to QAPP	SPM, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	QAPP approval dialogue
Health and Safety On-Site Meeting	HSO, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	Explain Site hazards, personnel protective equipment, hospital location, etc.
Lab Data Quality Issues (including sample receipt variances and laboratory quality control variances)	Laboratories Project Managers CLP Laboratory: Chemtech PM Chemtex PM Non-CLP Laboratory: Eurofins TestAmerica	 Mohammad Ahmed Dr. C. N. Reddy Mike Franks	 (908) 728-3151 (409) 983-4575 (314) 787-8201	Laboratories PM's will report any issues with project samples to the EPA RSCC or WESTON Chemist QA/QC Specialist within 1 business day of notification. The WESTON Chemist QA/QC Specialist will contact the field sampler if necessary to resolve sample receiving discrepancies.
Data verification and data validation issues	STARTV Data Validator	Smita Sumbaly	(732) 585-4410	The EPA ESAT data validators will review CLP data and START V Data Validator will review non-CLP data verification and validation.
Analytical Corrective Actions	WESTON Chemist QA/QC Specialist START V Data Validator or Laboratory PMs	Smita Sumbaly	(732) 585-4410	If laboratories corrective actions are necessary, the WESTON Chemist QA/QC Specialist will communicate with laboratory project manager.
Data Tracking and Management, Release of Analytical Data	WESTON SPM, Operations Manager	Bernard Nwosu	(732) 585-4413	The need for corrective actions will be determined by the SPM upon review of the data. No analytical data will be released prior to validation and all releases must be approved by the Chemist QA/QC Specialist, SPM and EPA OSC/TM.

OSC: On-Scene Coordinator
SPM: Site Project Manager
HSO: Health and Safety Officer
RSCC: Regional Sample Control Coordinator
ESAT: Environmental Services Assessment Team

QAPP Worksheet #9: Project Planning Session Summary

Date of Planning Session: 10/01/2019

Location: Phone Call

Purpose: Scoping meeting for UFP-QAPP for EPA Region II Superfund Technical Assessment & Response Team V

Name	Title/Role	Organization	E-mail Address	Phone No.
Eric Daly	EPA OSC	EPA	Daly.Eric@epa.epamail.gov	(732)-321-4350
Bernard Nwosu	START V	WESTON	Ben.Nwosu@WestonSolutions.com	(732) 585-4413

Site-Specific Initial Scoping Meeting Notes/Comments:

As part of Removal Assessment activities at the 738 Upper Mountain Road Site (the Site), Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) has been tasked by the U.S. Environmental Protection Agency, Region II (EPA) with providing field support for soil sampling activities at off-site and on-site locations in view of a potential Removal Action. The scope of work (SOW) includes clean fill (2-inch crusher run) sampling at off-site vendor facilities and on-site disposal soil sampling. The vendor facilities and fill material stockpile to be sampled and on-site sample location will be determined by the EPA On-Scene Coordinator (OSC).

Clean fill sampling is being conducted to verify that the fill material at the vendor facilities meet the requirements of the New York Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives (UUSCO) in accordance with New York Codes, Rules and Regulations (NYCRR) 375, for use as backfill at the Site. Based on the estimated volume of contaminated soil (approximately 102 cubic yards) anticipated to be excavated from the approximately 1,378.98 square feet AOC at the Site, and in accordance with NYSDEC *Division of Environmental Remediation (DER)-10, Technical Guidance for Site Investigation and Remediation* (May 3, 2010), up to five grab discrete clean fill samples, including quality assurance/quality control (QA/QC) samples, will be collected for target compound list (TCL) volatile organic compounds (VOCs) analysis and up to three composite clean fill sample, including QA/QC samples, will be collected for percent moisture, TCL semivolatile organic compound (SVOCs), TCL pesticides, polychlorinated biphenyls (PCBs), target analyte list (TAL) metals including mercury, cyanide, radiological parameters including gamma spectroscopy for thorium (Th)-234, protactinium (Pa)-234 or Pa-234m, lead (Pb)-214, and bismuth (Bi)-214 from the uranium decay chain; radium (Ra)-228 and/or actinium (Ac)-228, Ra-224, Pb-212, Bi-212, and thallium (Tl)-208 from the thorium decay chain; other gamma emitting radioisotopes including cesium (Cs)-137 and potassium (K)-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth; and alpha spectroscopy for uranium (U)-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. The clean fill samples will be collected for definitive data objective using dedicated sampling equipment (i.e., Encore™ samplers and stainless steel scoops); therefore, rinsate samples are not required. The QA/QC samples will include one field duplicate and additional sample volumes designated for matrix spike/matrix spike duplicate (MS/MSD) analyses.

QAPP Worksheet #9: Project Planning Session Summary (Continued)

Prior to mobilizing to the Site, START V will contact Dig Safely New York to conduct subsurface utilities mark-out around the Site. Subsequently, disposal soil samples comprising a heterogeneous mix of soil/slag/rock will be collected for disposal analysis to determine the appropriate disposal facility to receive the contaminated soil from the Site during the Removal Action phase of the project. Utilizing dedicated stainless steel hand augers, one soil boring will be advanced at a location to be determined on-site by the EPA OSC. Up to four grab disposal samples, including QA/QC samples, will be collected for definitive data objective using dedicated sampling equipment (i.e., Encore™ samplers and stainless steel scoops) from depths 0 to 12 inches and 12 to 24 inches below ground surface (bgs), respectively at the selected sample location on-site; therefore rinsate samples are not required. The QA/QC samples will include one field duplicate and additional sample volumes designated for MS/MSD analyses. The disposal soil samples will be submitted for laboratory analysis, including TCL VOCs, percent moisture, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, Resource Conservation and Recovery Act (RCRA) characteristics (ignitability, reactive cyanide, reactive sulfide, pH), and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Field duplicate and MS/MSD samples will not be collected for TCLP and RCRA analyses. For TCLP and RCRA analyses, only screening data is required.

All Site activities will be noted in the Site logbook and documented with digital photographs. All sampling data will be entered into the Site-Specific Scribe database. Sampling locations will be documented with Global Positioning System (GPS) technology.

Consensus Decisions Made:

The off-site clean fill sampling and on-site disposal soil sampling is scheduled to begin on the week of October 21, 2019. The analytical results of the clean fill and disposal soil samples will be compared with EPA Removal Management Levels (RMLs) for residential soils, NYSDEC UUSCOs, and the EPA Site-Specific Preliminary Remediation Goals (PRGs) for radiological parameters. In addition the analytical results of the disposal soil samples will also be compared with the EPA Maximum Concentration of Contaminants (MCC) for the toxicity characteristic as determined by TCLP. The analytical results of the clean fill samples will be utilized by EPA to verify if the clean fill meets the NYSDEC requirement for use as backfill at the Site and the analytical results of the disposal soil samples will be utilized by EPA to determine the disposal facility to receive the contaminated soil during the Removal Action phase of the project.

QAPP Worksheet #9: Project Planning Session Summary (Concluded)

Action Items:

Action	Responsible Party	Due Date
Prepare CLP Analytical Request Form	SPM, START V	10/04/2019
Prepare RST Analytical Request Form	SPM, START V	10/04/2019
Develop Health and Safety Plan	SPM, START V	10/18/2019
Develop Quality Assurance Project Plan	SPM, START V	10/18/2019
Develop Work Plan (driller, sampler, survey, etc.)	SPM, START V	Not Applicable
Develop Equipment List	SPM, START V	10/18/2019
Develop Site-Specific Data Management Plan	SPM, START V	10/18/2019

QAPP Worksheet #10: Conceptual Site Model

Background Information:

The Site is situated at 738 Upper Mountain Road in Lewiston, New York and the geographic coordinates are 43.15553, -79.02245. The Site consists of a small area of concern (AOC) with radionuclide contamination approximately 1,493 square feet (ft^2), and is located on the vacant, approximately 10.2 acre parcel 115.08-1-27 owned by Talarico Bros. Building Corp (TBBC). The AOC is located at the entrance of the driveway currently utilized by the 738 Upper Mountain Road residence although the driveway was historically used as an access road to the vacant TBBC property. The residence is on a separate property from the AOC. The Site is bordered to the north by Upper Mountain Road, residential properties, and a further wooded area; to the east and west by residential properties; and to the south by a wooded area.

In July 1985, members of the Radiological Survey Activities (RASA) group at Oak Ridge National Laboratory (ORNL) performed a radiological survey of 738 Upper Mountain Road and documented a maximum gamma exposure rate of 710 microroentgens per hour (µR/hr). The area where this reading was collected is approximately 10 feet wide by 59 feet in length along a ditch and gravel residential driveway. The survey showed that the 738 Upper Mountain Road anomaly is associated with the asphalt driveway that contained a phosphate slag material. This rocky-slag waste material was used for bedding under asphalt surfaces and in general gravel applications at the Site and 61 other locations in the Niagara Falls area identified by ORNL.

Biased surface soil samples collected in conjunction with the study indicated the presence of radium-226 (Ra-226), uranium-238 (U-238), and thorium-232 (Th-232) at the Site. The subsequent November 1986 report stated that all the contaminated soil and rock samples collected had approximately equal concentrations of Ra-226 and U-238, which suggests that the rocks probably originated from a singular source. The origin of the thorium-bearing material was unknown; the report postulated that its source was from some type of mineral extraction activity in the Niagara Falls area. The report stated that the 738 Upper Mountain Road anomaly was not related to materials connected with Niagara Falls Storage Site (NFSS), including materials that were transported to NFSS.

During a reconnaissance performed by the New York State Department of Health (NYSDOH) and New York State Department of Environmental Conservation (NYSDEC) on July 9, 2013, screening activities showed radiation levels at 300 µR/hr with a hand-held pressurized ion chamber (PIC) and 105,000 to 110,000 counts per minute (cpm) with a sodium iodide (NaI) 2x2 scintillation detector; the singular reading was taken at the end of the driveway adjacent to Upper Mountain Road.

On December 12, 2013, Weston Solutions, Inc., Site Assessment Team (SAT) collected a total of nine soil samples and two slag samples from the Site. At each sample location, soil samples were collected directly beneath slag material; at locations where a radioactive layer was not present the soil sample was collected at the equivalent depth interval. The slag samples consisted of pulverized silty sand with rocks, cobbles, and gravel (*i.e.*, radioactive waste material mixture) rather than singular pieces of slag. The soil and slag samples, and aqueous rinsate blank, were

QAPP Worksheet #10: Conceptual Site Model (Continued)

analyzed for target analyte list (TAL) metals, including mercury; isotopic thorium, isotopic uranium, Ra-226, and radium-228 (Ra-228) by alpha spectroscopy; and other radioisotopes by gamma spectroscopy. Analytical results indicated concentrations of radionuclides found in the slag and soil to be significantly higher than at background conditions.

On May 1 and 2, 2014, SAT collected radon and thoron concentration measurements from locations on and in the vicinity of the Site. The radon and thoron measurements were collected at heights of one meter above the ground surface. During the May 2014 air monitoring event, background radon concentrations were measured at 0.16 +/- 0.13 picocuries per liter (pCi/L) (to account for maximum background concentrations, the uncertainty value is added to the background measurement for an adjusted concentration of 0.29 pCi/L) during the morning hours on May 2, 2014 and an adjusted value of 0.12 pCi/L during the afternoon hours on May 1, 2014. Background thoron concentrations were calculated to be 0.060 pCi/L (adjusted concentration) during the morning hours on May 2, 2014 and an adjusted value of 0.15 pCi/L during the afternoon hours on May 1, 2014. There were no radon or thoron concentrations that exceeded the site-specific background, nor were there any adjusted concentrations that equaled or exceeded a value two standard deviations above the mean site-specific background concentrations for these radionuclides in ambient air.

On October 25, 2016, the U.S. Environmental Protection Agency, Region II (EPA) and Weston Solutions, Inc., Removal Support Team 3 (RST 3) conducted radiological survey inside the one residence located in proximity to the AOC and exterior areas of the Site. A hand-held NaI 3x3 scintillator attached to a Ludlum-2241 gamma meter was utilized to conduct radiological survey in the residence, and an all-terrain vehicle (ATV) with a Ludlum-2241 and NaI 3x3 scintillator setup connected to a wireless network-based communication system was utilized to conduct mobile ground radiological survey throughout the Site and areas surrounding the residence. Gamma readings collected within the residence were at background levels (10 to 12 μR/hr). Exterior gamma reading generally ranged from background to less than three time (3x) background except at a small area of the driveway entrance currently utilized by the 738 Upper Mountain Road residence where gamma readings were as high as 462.2 μR/hr.

On November 18, 2016, EPA and RST 3 continued Removal Assessment activities at the Site. Based on radiological survey measurements collected during the October 2016 Removal Assessment event, test pits were advanced on-site to depths of 2 feet below ground surface (bgs) at four location selected by EPA. A total of 17 heterogeneous samples of soil/slag/rock, including quality assurance/quality control (QA/QC) samples, were collected from the side walls of each test pit at 6 inch intervals from 0 to 6, 6 to 12, 12 to 18, 18 to 24 inches bgs.

In December 2016, RST 3 utilized a High-purity Germanium (HPGe) detector to perform quantitative gamma spectrometry analysis of the heterogeneous samples of soil/slag/rock collected from the Site in November 2016. Subsequently, all the heterogeneous samples of soil/slag/rock were submitted to the assigned laboratory for Bi-212, Cs-137, K-40, Pb-212, Pa-234, Ra-226, Ra-228, Th-228, Th-230, Th-232, Th-234, Tl-208, U-233/234, U235/236, U235, and U238, analyses. The analytical results were compared with the Site-Specific Action Levels (SSALs) established by

QAPP Worksheet #10: Conceptual Site Model (Concluded)

EPA in March 2019 for the target radioisotopes. Based on analytical results, the concentrations of Pa-234M and Th-228 exceeded the respective EPA SSALs in nine samples with exceedance concentrations identified in at least one depth interval from 0 to 24 inches bgs at all four test pit locations. In addition, the concentrations of Bi-212, Pb-212, Ra-226, Ra-228, Tl-208, Th-230, Th-232, Th-234, U-233/234, and U-238, exceeded the EPA SSALs in all the samples collected from one particular test pit location. Furthermore, analytical and radiological survey results were utilized to estimate the volume of contaminated soil at the AOC. The vertical extent of the radiological contamination was estimated at 2 feet bgs based on radionuclide exceedance concentrations from analytical results, and the impacted surface area was estimated at 128.11 square meters (1,378.98 square feet) based on radiological survey results where gamma readings exceeded 3x background. Approximately 102.15 cubic yards of contaminated soil is estimated to be present at the AOC on-site.

On August 11 through 14, 2017, personnel from RST 3-procured National Radon Safety Board (NRSB)-certified Company, Accu-View Property Inspections (Accu-View), performed radon sampling in the one residence located in proximity to the AOC. A total of eight activated charcoal canisters (radon canisters), including one field duplicate, were deployed for radon sampling at the residence. When compared with the EPA Action Level of 4.0 pCi/L for radon, analytical results indicted radon concentrations were below the EPA Action Level.

QAPP Worksheet #11: Project/Data Quality Objectives

1. State the Problem:

EPA is planning a Removal Action to address the presence of radionuclide contamination at an AOC on Site. The anticipated remedy is the excavation and off-site disposal of the contaminated soil at the Site. Therefore, EPA has requested support from START V to sample clean fill at off-site vendor facilities for laboratory analysis in order to verify that the fill materials meet the NYSDEC requirement for use as backfill at the Site. In addition, disposal soil samples will be collected on-site for laboratory analysis to determine disposal facilities that can receive the contaminated soil during the Removal Action phase of the project.

2. Identify the Goals of the Study:

The analytical results of the clean fill samples will be compared with EPA RMLs for residential soil, NYSDEC UUSCOs, and the EPA Site-Specific PRGs for radiological parameters.

The analytical results of the clean fill samples will be utilized by EPA to verify that the fill materials meet the requirements of the NYSDEC UUSCO for use as backfill for excavated areas of the Site during the Removal Action.

If the analytical results indicate that the fill material sampled from the vendor facilities do not meet the requirements of the NYSDEC UUSCO, then EPA will sample fill material from other vendors.

The analytical results of the disposal soil samples will be compared with EPA RMLs for residential soil, NYSDEC UUSCOs, EPA MCCs for toxicity characteristic as determined by TCLP, and the EPA Site-Specific PRGs for radiological parameters.

The analytical results of the disposal soil samples will be utilized by EPA to verify the overall composition of the on-site soil in order to determine disposal facilities that can receive the contaminated soil during the Removal Action.

3. Identify Information Inputs:

Up to five grab and three composite clean fill samples, including QA/QC samples, will be collected from three locations at each off-site vendor facility for laboratory analyses, including TCL VOCs, percent moisture, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228.

Up to four grab disposal soil samples, including QA/QC samples, will be collected at depths of 0 to 12 inches bgs and 12 to 24 inches bgs, respectively from one location on-site for laboratory analyses, including TCL VOCs, percent moisture, TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, RCRA characteristics (ignitability, reactive

QAPP Worksheet #11: Project/Data Quality Objectives (Continued)

cyanide, reactive sulfide, pH), and radiological parameters including gamma spectroscopy for Th-234, Pa234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228,

Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Field duplicate will not be collected for TCLP and RCRA analyses.

4. Define the Boundaries of the Study:

Overall project objectives include: To utilize analytical results to determine a clean fill vendor facility to supply fill material and a disposal facility to receive contaminated soil from the Site in view of the Removal Action phase of the project.

Who will use the data? Data will be used by EPA, Region II OSC.

5. Develop the Analytic Approach:

Analytical Techniques:
CLP Methods: ISM02.4, SOM02.4.
SW-846 Methods: Chapter 7 for Reactivity, 9014/9034, 1030, 9045D, 8151A.
EPA Method 901.1, Health and Safety Laboratory (HASL) 300/GA-01-R, HASL-300/A-01-R.
Type of Data: Definitive data
Matrix: Soil
Parameters:
Gamma Spectrometry – homogenized with 21-day ingrowth

- Ra-226 using Bi-214 and/or Pb-214 (if only one progeny radionuclide is used, either Bi-214 or Pb-214, provide the other radionuclide's activity)

From the Uranium Decay Chain: Th-234, Pa-234m
From the Thorium Decay Chain: Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, Tl-208
Other gamma emitting radionuclides: Cs-137 and K-40

Alpha Spectrometry – total dissolution of the sample to ensure complete homogenization of dense, rock-like contaminant in sample

- Isotopic Uranium: U-233/234, U-235/236, U-238
- Isotopic Thorium: Th-230, Th-232, Th-228

ICP-MS:

- Isotopic Uranium: U-233/234, U-235/236, U-238
- Isotopic Thorium: Th-232, and Th-230 if possible

RCRA Characteristics (Reactivity, Cyanide/Sulfur, Ignitability, and pH)
TAL Metals, including mercury and cyanide

QAPP Worksheet #11: Project/Data Quality Objectives (Concluded)

Full TCL (TCL Volatiles, Semivolatiles, Pesticides, and PCBs)
Full TCLP (TCLP Volatiles, Semivolatiles, Pesticides, Herbicides, and TCLP Metals including Mercury)

Sampling Equipment: Encore™ samplers, stainless steel scoops and hand augers, glass sample jars, aluminum pans, re-sealable plastic bags.
Access Agreement: Obtained by EPA, Region II OSC.
Sampling Locations: Sample locations will be identified by the EPA OSC.
How much data are needed? Up to five clean fill soil samples, including field duplicate and MS/MSD samples; and up to four disposal soil samples, including field duplicate and MS/MSD samples.

6. **Specify Performance or Acceptance Criteria:**

How "good" does the data need to be in order to support the environmental decision?
Sampling/analytical measurement performance criteria (MPC) for Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameters will be established. Refer to Worksheet #12, criteria for performance measurement for definitive data.

Where, when, and how should the data be collected/generated?
Up to five grab and three composite clean fill samples, including QA/QC samples, will be collected from three locations at each off-site vendor facility and up to four grab disposal soil samples, including QA/QC samples, will be collected at depths of 0 to 12 inches bgs and 12 to 24 inches bgs, respectively from one location to be determined on-site by the EPA OSC. The sampling event is scheduled to beginning on October 22, 2019 and will be completed the same day. All field and sampling activities will be performed in accordance with methods outlined in EPA's ERT/Scientific, Engineering, Response and Analytical Services (SERAS) contractor's Standard Operating Procedures (SOPs).

7. **Develop the Detailed Plan for Obtaining Data**

Who will collect and generate the data? The clean fill and disposal soil samples will be collected by START V and submitted to the assigned laboratories for TCL VOCs, TCL SVOCs, TCL Pesticides, PCBs, TAL metals including mercury, cyanide, Full TCLP, RCRA characteristics, and radiological parameters (gamma spectroscopy and alpha spectroscopy). Non-CLP data will be validated by the START V data validator and CLP data will be validated by EPA Environmental Services Assessment Team (ESAT) data validation personnel.

How will the data be reported? All data will be reported by the assigned laboratory (Preliminary, Electronic, and Hard Copy format). The Site Project Manager will provide a Sampling Trip Report, Status Reports, Maps/Figures, Analytical Report, and Data Validation Report to the EPA OSC.

How will the data be archived? Electronic data deliverables will be archived in a Scribe database.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12A1: Gamma Spectroscopy by EPA Method 901.1 (Non-CLP Worksheet)

Matrix: Soil
Analytical Group/Method: Radiochemistry (Gamma Spectroscopy)
Concentration Level: Low/Medium (Activity per Gram)

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Bias/Contamination	Method Blank	No radionuclides detected above the target detection limit (MDC)
Accuracy/Bias	LCS	Recovery limits as specified in Worksheet #28A
Precision	Sample Duplicate	RPD Limit of 40% or Normalized Difference < 3

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12A2: Alpha Spectroscopy - HASL 300 A-01-R (Non-CLP Worksheet)

Matrix: Soil
Analytical Group/Method: Radiochemistry (Alpha Spectroscopy)
Concentration Level: Low/Medium (Activity per Gram)

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Bias/Contamination	Method Blank	No radionuclides detected above the target detection limit (MDC)
Accuracy/Bias	LCS	Recovery limits as specified in Worksheet #28B
Precision	Sample Duplicate	RPD Limit of 40% or Normalized Difference < 3
Accuracy/Bias	Tracer (every sample)	Recovery limits of 30-110%

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12A3: Alpha and Gamma Spectroscopy by SW846 Method 6020A (Non-CLP Worksheet)

Matrix: Soil
Analytical Group/Method: Radiochemistry (ICP-MS)
Concentration Level: Low/Medium (Activity per Gram)

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Bias/Contamination	Method Blank	No radionuclides detected above the target detection limit (MDC)
Accuracy/Bias	LCS	Recovery limits of 80-120% (uranium isotopes) Recovery limits of 70-130% (thorium)
Accuracy/Precision	MS/MSD	Recovery limits of 75-125%; RPD Limit of 30% (uranium isotopes) Recovery limits of 50-150%; RPD Limit of 30% (uranium isotopes)

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12B: Volatile Organic Compounds (VOCS) by GC/MS (CLP Worksheet)

Matrix: Soil, TCL/TCLP Leachate
Analytical Group/Method: VOCs/ SOM02.4
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (soil matrix; not required for Waste or TCLP leachates)	Soil RPD: ≤50%
Precision – Laboratory - NR	MS/MSD[3]	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples (LCS is not required by SOM02.4.)	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference) - NR	MS/MSD	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and/or laboratory SOP	SOM02.4: %R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank for SOM02.4 Storage Blank (SOM02.4): 1 per SDG TCLP LEB (SOM02.4): 1 per extraction batch of 20 samples	SOM02.4 Blanks: ▪ Method: concentrations <CRQL except for methylene chloride, acetone, and 2-butanone which must be < 2xCRQL ▪ Instrument: < CRQL ▪ Storage: <CRQL except for methylene chloride, acetone, and 2-butanone which must be < 2xCRQL ▪ TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Trip Blank, Equipment Blank, Ambient Field blank[1]	All analyte concentrations < CRQL or RL
Accuracy - Laboratory	PE samples[2]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs	Action Level at least 3 to 10x > CRQL or RL

QC Samples for VOCs by GC/MS are listed along with their method-specified frequency and MPCs.
[1]Equipment blanks are not required if the sample is collected with dedicated sampling equipment.
[2]PE samples will only be ordered at the specific request of the EPA TM or OSC.
[3]As per CLP protocol, MS/MSD analysis not required.
Soil samples for VOCs analysis only will be collected using EnCore sampling devices and placed in tared volatile organic analysis (VOA) vials in the field.
Soil samples for VOCs analysis only will also require sample collected in separate glass jar for percent solids determination.
Refer to optimized QAPP Worksheet 19&30 for details.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12C: Semivolatile Organic Compounds (SVOCS) (CLP Worksheet)

Matrix: Soil, TCL/TCLP Leachate
Analytical Group/Method: SVOCs/ SOM02.4
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (soil matrix; not required for TCLP leachates)	Soil RPD: ≤50%
Precision – Laboratory - NR	MS/MSD[3]	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix. (Not required by SOM02.4.)	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference) -NR	MS/MSD[3]	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	SOM02.4: %R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank (all methods): 1 per extraction batch of 20 samples Instrument blank (all methods): run after high concentration samples or detector saturation **TCLP LEB (SOM02.4):** 1 per TCLP extraction batch of 20 samples	SOM02.4 Blanks: • Method: concentrations <CRQL • Instrument: < CRQL • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL or RL
Accuracy - Laboratory	PE samples[2]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

QC Samples for SVOCs by gas chromatography/mass spectrometry (GC/MS) are listed along with their method-specified frequency and MPCs.
[1]Blank media which have not been opened and exposed to the sampling environment will be provided as lot blanks.
[2]PE samples will only be ordered at the specific request of the EPA TM or OSC.
[3]As per CLP protocol, MS/MSD analysis not required.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12D: Organochlorine (OC) Pesticides by GC/ECD (CLP Worksheet)

Matrix: Soil, TCL/TCLP Leachate
Analytical Group/Method: Pesticides/ SOM02.4
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (soil matrix; not required for TCLP leachates)	Soil RPD: ≤50%
Precision - Laboratory	MS and MSD (all pesticide methods): 1 per 20 samples of each matrix	SOM02.4: RPDs specified for each matrix in the method.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	SOM02.4: %R specified for each matrix in the method
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	SOM02.4: %R within limits specified in the method
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	SOM02.4: %R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank (all methods): 1 per extraction batch Instrument blank (SOM02.4): as specified by method TCLP/SPLP LEB (SOM02.4 and EPA 8081A): 1 per extraction batch of 20 samples	SOM02.4 Blanks: • Method: concentrations <CRQL • Instrument: < CRQL • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL or RL
Accuracy - Laboratory	PE samples[1]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]PE samples will only be ordered at the specific request of the EPA TM or OSC.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12E: Polychlorinated Biphenyls (PCBs) as Aroclors by GC/ECD (CLP Worksheet)

Matrix: Soil
Analytical Group/Method: PCBs as Aroclors/ SOM02.4
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Soil RPD: ≤50%
Precision - Laboratory	MS and MSD (all PCB methods): 1 per 20 samples of each matrix	SOM02.4: RPDs specified for each matrix in the method.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	SOM02.4: %R specified for each matrix in the method
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	SOM02.4: %R within limits specified in the method
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	SOM02.4: %R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank for SOM02.4: 1 per extraction batch of 20 samples Instrument blank (all methods): At the frequency specified in SOM02.4 and/or after high concentration samples	SOM02.4 Blanks: • Method: concentrations <CRQL • Instrument: < CRQL
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank Lot Blank (wipes only) – 1 per lot of media[1]	All analyte concentrations < CRQL or RL
Accuracy - Laboratory	PE samples[2]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]PE samples will only be ordered at the specific request of the EPA TM or OSC.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12F: Chlorinated Herbicides by GC/ECD (Non-CLP Worksheet)

Matrix: Soil/TCLP Leachate
Analytical Group/Method: Herbicides/ EPA 8151A
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (soil matrix; not required for TCLP leachate)	Water RPD: ≤30% Soil RPD: ≤50%
Precision – Laboratory	MS and MSD: 1 per 20 samples of each matrix	RPDs within statistically derived laboratory acceptance limits
Accuracy/Bias - Laboratory	LCS: 1 per extraction batch of up to 20 samples of each matrix *(Full list spike is required)*	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	%R within statistically derived laboratory acceptance limits
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per extraction batch Instrument blank: After high concentration samples TCLP/SPLP LEB: 1 per extraction batch of 20 samples	EPA 8151A Blanks: • Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater • Instrument: analyte concentrations < MDL • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL or RL
Accuracy - Laboratory	PE samples[1]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits [2]	Action Level at least 3 to 10x > RL

[1]PE samples will only be ordered at the specific request of the EPA TM or OSC.
[2]Laboratory RLs and MDLs will be reviewed only for non-CLP methods prior to award of analytical services to a WESTON-subcontracted laboratory.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12G: Metals and Mercury (CLP Worksheet)

Matrix: Soil, TAL/TCLP Leachates
Analytical Group/Method: Metals and Mercury / ISM02.4
Concentration Level: Low

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (Required for soil; not required for TCLP leachates)	Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate: (Required for soil; not required for TCLP leachates)	ISM02.4: RPDs specified for each matrix in the method.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of similar matrix. (NOTE: LCS not required for mercury by SOM02.4.)	ISM02.4: %R specified for each analyte and matrix in the method
Accuracy/Bias – Laboratory (matrix interference)	MS: (Required for soil; not required for TCLP leachates)	ISM02.4: %Rs specified for each matrix in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per digestion batch Instrument blank: at beginning of analytical run (ICB), and after every 10 analytical samples (CCB) TCLP LEB: 1 per extraction batch of 20 samples	ISM02.4 Blanks: • Method: positive or negative concentrations must be < absolute value of the CRQL if the associated sample concentrations are < 10xCRQL • Instrument: < absolute value of the CRQL • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL (ISM02.4) or RL (other methods)
Accuracy - Laboratory	PE samples[1]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

Metals methods include Inductively-Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), Inductively-Coupled Plasma-Mass Spectroscopy (ICP-MS), and Cold Vapor Atomic Absorption (CVAA).

[1] PE samples will only be ordered at the specific request of the EPA TM or OSC.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12H: Total Cyanide (CLP Worksheet)

Matrix: Soil
Analytical Group/Method: Total Cyanide / ISM02.4
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (Required for soil matrix)	Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate: (Required for soil)	ISM02.4: If both initial and duplicate sample concentrations are ≥ 5xCRQL, 20% RPD; otherwise the control limit is ±CRQL.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples (NOTE: A "distilled ICV" is required for cyanide by ISM02.4 but an LCS is required for other cyanide methods.)	ISM02.4: 85-115%R
Accuracy/Bias – Laboratory (matrix interference)	MS: (Required for water, drinking water, and soil/sediment; not required for Solid or Waste)	ISM02.4: 75-125%
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per distillation batch Instrument blank: at beginning of analytical run (ICB), and after every 10 analytical samples (CCB)	ISM02.4 Blanks: • Method: positive or negative concentrations must be < absolute value of the CRQL if the associated sample concentrations are < 10xCRQL • Instrument: < absolute value of the CRQL
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL (ISM02.4) or RL (other methods)
Accuracy - Laboratory	PE samples[1]	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1] PE samples will only be ordered at the specific request of the EPA TM or OSC.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12I: Resource Conservation and Recovery Act (RCRA) Characteristics by SW-846 Methods (Non-CLP Worksheet)

Matrix: Soil

Analytical Group: RCRA Characteristics

Concentration Level: Low

Data Quality Indicators (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance
Precision (field)	Project-Specific 50 %RPD	Field Duplicate
Precision (laboratory)	Project-Specific 20%RPD; List compound specific RPD	Laboratory Duplicate;
Accuracy (laboratory)	List compound specific %R	MS/MSD

[1] Note: Above measurement performance criteria can be changed based on laboratory in-house QC limits.

QAPP Worksheet #13: Secondary Data Criteria and Limitations

Any data needed for project implementation or decision making that are obtained from non-direct measurement sources such as computer databases, background information, technologies and methods, environmental indicator data, publications, photographs, topographical maps, literature files and historical data bases will be compared to the DQOs for the project to determine the acceptability of the data. Thus, for example, analytical data from historical surveys will be evaluated to determine whether they satisfy the validation criteria for the project and to determine whether sufficient data was provided to allow an appropriate validation to be done. If not, then a decision to conduct additional sampling for the site may be necessary.

Data Type	Data Source (Originating Organization, Report Title, and Date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
EPA Removal Assessment, August 2016 and 2017	RST 3 Removal Assessment Sampling Report, 2016 and 2017 Events, March 26, 2019 DC No: RST3-05-F-0075	To verify the presence of residual radiological contamination in soil, identify potential releases of radiation-containing materials in soil and fill material, determine additional radiation source areas, and delineate the extent of on-site radiological contamination	None

QAPP Worksheet #14 & 16: Project Tasks and Schedules

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop Project-Specific Health and Safety Plan (HASP)	WESTON	10/03/2019	10/18/2019	HASP	10/21/2019
Develop Project-Specific QAPP/Revisions	WESTON	10/03/2019	10/18/2019	QAPP	10/21//2019
Coordination with EPA Region II RSCC for Regional or CLP analytical support or procure WESTON-subcontracted laboratory for analytical services	WESTON	10/03/2019	10/03/2019	Region II RSCC documentation (laboratory assignment) or WESTON Purchase Order for analytical services	NA
Scoping meeting Operations Manager, SPM, HSO, and sampling team to discuss data collection activities, objectives, and logistics	WESTON	10/01/2019	10/01/2019	Meeting Notes	NA
Mobilization/Demobilization	WESTON	10/19/2018	10/19/2018	Field Notes	NA
Sample Collection Tasks	WESTON	10/23/2019	10/24/2019	Field Notes	NA
Analytical Tasks	WESTON	10/28/2019	11/18/2019	Field Notes/Laboratory Reports	11/18/2019
Quality Control Tasks	WESTON	10/28/2019	11/18/2019	Report of Analyses/Data Package	11/18/2019
Data Validation	WESTON	11/18/2019	12/13/2019	Validation Summary Report	12/13/2019
Summarize Data	WESTON	12/16/2019	12/20/2019	Project-Specific Summary Report/Table	12/20/2019
Develop Project-Specific Report	WESTON	12/16/2019	12/30/2019	Draft Project-Specific Report	12/30/2019
Address EPA comments on Draft Project-Specific Report	WESTON	12/31/2019	1/12/2020	Project-Specific Report	1/12/2020
Contract Closeout	WESTON	7/22/2019TBD	6/30/2020	Contract Closeout Report	6/30/2020

Note: All dates listed above are approximate dates, actual deliverable will be provided based on sampling date and the date analytical data will be received from the lab.
NA – Not Applicable

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Sampling Tasks:

Up to five grab and three composite clean fill samples, including QA/QC samples, will be collected from three locations at each off-site vendor facility for laboratory analyses, including TCL VOCs, percent moisture, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228.

Up to four grab disposal soil samples, including QA/QC samples, will be collected at depths of 0 to 12 inches bgs and 12 to 24 inches bgs, respectively from one location on-site for laboratory analyses, including TCL VOCs, percent moisture, TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, RCRA characteristics (ignitability, reactive cyanide, reactive sulfide, pH), and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Field duplicate and MS/MSD samples will not be collected for TCLP and RCRA analyses.

Analysis Tasks:

Soil – TCL VOCs/TCLP VOCs:	CLP SOW SOM02.4
Soil – TCL SVOCs/TCLP SVCs:	CLP SOW SOM02.4
Soil – TCL Pesticides/TCLP Pesticides:	CLP SOW SOM02.4
Soil – TCL PCB:	CLP SOW SOM02.4
Soil – TAL metals/TCLP Metals:	CLP SOW ISM02.4
Soil – Mercury/TCLP Mercury:	CLP SOW ISM02.4
Soil – Cyanide:	CLP SOW ISM02.4
Soil – TCLP Herbicides:	Method 8151A
Soil - RCRA characteristics (Ignitability):	Method 1030
Soil - RCRA characteristics (Reactivity CN/S):	Method SW846, 9014/9034 (CN/S)
Soil - RCRA characteristics (pH):	Method 9045D
Soil - Gamma Spectroscopy:	EPA Method 901.1
Soil – Alpha Spectroscopy:	HASL 300 A-01-R
Soil - Alpha and Gamma spectroscopy	SW846 Method 6020A (ICP-MS)

Decontamination: Dedicated sampling equipment will be utilized, therefore decontamination of sampling equipment will not be necessary.

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Quality Control Tasks: Definitive data deliverable has been requested for clean fill and disposal soil samples for Full TCL, TAL Metal, including mercury and cyanide, Full TCLP, RCRA Characteristics, and radiological parameters (gamma spectroscopy and alpha spectroscopy); therefore one field duplicates and one MS/MSD sample will be collected per matrix per 20 samples. Screening data deliverable requested for the disposal soil samples for Full TCLP and RCRA Characteristics; therefore, MS/MSD and field duplicate samples will not be collected.

Data Management Tasks: Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports. The following deliverables will be provided under this project:

Trip Report: A trip report will be prepared to provide a detailed accounting of what occurred during each sampling mobilization. The trip report will be prepared within two weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations).

Maps/Figures: Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

Analytical Report: An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Data Review: A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be provided separately, or as part of the analytical report.

Documentation and Records:

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook: The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. Field logbook will be bound and paginated. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Concluded)

8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody information
11. Record of photographs
12. Site sketches

* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

Sample Labels: Sample labels will clearly identify the particular sample, and should include the following:

1. Site/Project number
2. START V Sample identification number.
3. Sample collection date and time
4. Analytical Parameters
5. Sample preservation

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

Custody Seals: Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

Assessment/Audit Tasks: No performance audit of field operations is anticipated at this time. If conducted, performance and system audit will be in accordance with the project plan.

Data Review Tasks: All non-CLP data will be validated by the START V data validators and CLP data will be validated by EPA ESAT data validation personnel.

The data generated under this QA/QC Sampling Plan will be evaluated according to guidance in the Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental Data Collection and Use Programs Part 1: UFP-QAPP (EPA-105-B-04-900A, March 2005); Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities (EPA-105-B-04-900B, March 2005). Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

QAPP Worksheet #15A: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil
Analytical Group: Gamma Spec-GA-01-R/Alpha Spec-a-01-R/ICP-MS
Concentration Level: Low/Medium

Analyte Description	CAS Number	Action Limit*	Method Detection Limit (mg/L)
Gamma Spec – GA-01-R – pCi/g			
Actinium 228	14331-83-0		1.00
Bismuth-212	14913-49-6		3.00
Bismuth-214	14733-03-0		1.00
Cesium-137	10045-97-3		0.200
Lead-212	15092-94-1		0.300
Lead-214	15067-28-4		1.00
Potassium-40	13966-00-2		1.50
Protactinium-234	378783-76-7		1.50
Radium-224	13233-32-4		5.00
Radium-226	13982-63-3		1.00
Radium-228	15262-20-1		1.00
Thallium-208	14913-50-9		0.200
Thorium-234	15065-10-8		4.00
Isotopic Uranium (Alpha Spec) – A-01-R – pCi/g			
Uranium-233/234	13966-29-5		1.00
Uranium-235/236	15117-96-1		1.00
Uranium-238	7440-61-1		1.00
Isotopic Thorium (Alpha Spec) – A-01-R – pCi/g			
Thorium-228	14274-82-9		1.00
Thorium-230	14269-63-7		1.00
Thorium-232	7440-29-1		1.00

Isotopic Uranium (ICPMS) – SW 846 Method 6020A – mg/Kg				
Analyte Description	**CAS Number**	**Action Limit***	RL	MDL
U-233	13968-55-3		0.00600	0.00300
U-234	13966-29-5		0.00600	0.00300
U-235	15117-96-1		0.00600	0.00300
U-236	13982-70-2		0.00600	0.00300
U-238	7440-61-1		0.00600	0.00300
Thorium (ICP/MS) – SW 846 Method 6020A - mg/Kg				
Thorium	7440-29-1		0.200	0.135

*Data will be compared with the Site-Specific Action Levels established by EPA in March 2019 (see Attachment C).

QAPP Worksheet #15B: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil
Analytical Group: TCL Volatiles
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 (Low) Quantitation Limits (mg/kg)	Analytical Method – SOM02.4 (Medium) Quantitation Limits (mg/kg)
Dichlorodifluoromethane	75-71-8		0.005	0.25
Chloromethane	74-87-3		0.005	0.25
Vinyl Chloride	75-01-4		0.005	0.25
Bromomethane	74-83-9		0.005	0.25
Chloroethane	75-00-3		0.005	0.25
Trichlorofluoromethane	75-69-4		0.005	0.25
1,1-Dichloroethene	75-35-4		0.005	0.25
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.005	0.25
Acetone	67-64-1		0.01	0.5
Carbon Disulfide	75-15-0		0.005	0.25
Methyl Acetate	79-20-9		0.005	0.25
Methylene Chloride	75-09-2		0.005	0.25
trans-1,2-Dichloroethene	156-60-5		0.005	0.25
Methyl tert-Butyl Ether	1634-04-4		0.005	0.25
1,1-Dichloroethane	75-34-3		0.005	0.25
cis-1,2-Dichloroethene	156-59-2		0.005	0.25
2-Butanone	78-93-3		0.01	0.5
Chloroform	67-66-3		0.005	0.25
1,1,1-Trichloroethane	71-55-6		0.005	0.25
Cyclohexane	110-82-7		0.005	0.25
Carbon Tetrachloride	56-23-5		0.005	0.25
Benzene	71-43-2		0.005	0.25
1,2-Dichloroethane	107-06-2		0.005	0.25
Trichloroethene	79-01-6		0.005	0.25
Methylcyclohexane	108-87-2		0.005	0.25
1,2-Dichloropropane	78-87-5		0.005	0.25
Bromodichloromethane	75-27-4		0.005	0.25
cis-1,3-Dichloropropene	10061-01-5		0.005	0.25
4-Methyl-2-Pentanone	108-10-1		0.01	0.5
Toluene	108-88-3		0.005	0.25
trans-1,3-Dichloropropene	10061-02-6		0.005	0.25
1,1,2-Trichloroethane	79-00-5		0.005	0.25
Tetrachloroethene	127-18-4		0.005	0.25
2-Hexanone	591-78-6		0.01	0.5
Dibromochloromethane	124-48-1		0.005	0.25
1,2-Dibromoethane	106-93-4		0.005	0.25
Chlorobenzene	108-90-7		0.005	0.25

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15B: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil
Analytical Group: TCL Volatiles - Concluded
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 (Low) Quantitation Limits (mg/kg)	Analytical Method – SOM02.4 (Medium) Quantitation Limits (mg/kg)
Ethylbenzene	100-41-4		0.005	0.25
Xylenes (total)	1330-20-7		0.005	0.25
Styrene	100-42-5		0.005	0.25
Bromoform	75-25-2		0.005	0.25
Isopropylbenzene	98-82-8		0.005	0.25
1,1,2,2-Tetrachloroethane	79-34-5		0.005	0.25
1,3-Dichlorobenzene	541-73-1		0.005	0.25
1,4-Dichlorobenzene	106-46-7		0.005	0.25
1,2-Dichlorobenzene	95-50-1		0.005	0.25
1,2-Dibromo-3-chloropropane	96-12-8		0.005	0.25
1,2,4-Trichlorobenzene	120-82-1		0.005	0.25

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15C: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil

Analytical Group: TCL Semivolatiles

Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 (Low) Quantitation Limits (ug/kg)	Analytical Method – SOM02.4 (Medium) Quantitation Limits (ug/kg)
1,4-Dioxane	123-91-1		67	2000
Benzaldehyde	100-52-7		330	10000
Phenol	108-95-2		330	10000
Bis(2-chloroethyl) ether	111-44-4		330	10000
2-Chlorophenol	95-57-8		170	5000
2-Methylphenol	95-48-7		330	10000
3-Methylphenol	108-39-4		-	-
2,2'-Oxybis(1-chloropropane)E	108-60-1		330	10000
Acetophenone	98-86-2		330	10000
4-MethylphenolA,C	106-44-5		330	10000
N-Nitroso-di-n propylamine	621-64-7		170	5000
HexachloroethaneC	67-72-1		170	5000
NitrobenzeneC	98-95-3		170	5000
Isophorone	78-59-1		170	5000
2-Nitrophenol	88-75-5		170	5000
2,4-Dimethylphenol	105-67-9		170	5000
Bis(2-chloroethoxy)methane	111-91-1		170	5000
2,4-Dichlorophenol	120-83-2		170	5000
NaphthaleneF	91-20-3		170	5000
4-Chloroaniline	106-47-8		330	10000
Hexachlorobutadiene	87-68-3		170	5000
Caprolactam	105-60-2		330	10000
4-Chloro-3-methylphenol	59-50-7		170	5000
2-Methylnaphthalene	91-57-6		170	5000
Hexachlorocyclo-pentadiene	77-47-4		330	10000
2,4,6-Trichlorophenol	88-06-2		170	5000
2,4,5-TrichlorophenolC	95-95-4		170	5000
1,1'-Biphenyl	92-52-4		170	5000
2-Chloronaphthalene	91-58-7		0.17	5.0
2-Nitroaniline	88-74-4		170	5000
Dimethylphthalate	131-11-3		170	5000
2,6-Dinitrotoluene	606-20-2		170	5000
Acenaphthylene	208-96-8		170	5000
3-Nitroaniline	99-09-2		330	10000
Acenaphthene	83-32-9		170	5000
2,4-Dinitrophenol	51-28-5		330	10000
4-Nitrophenol	100-02-7		330	10000
Dibenzofuran	132-64-9		170	5000
2,4-Dinitrotoluene	121-14-2		170	5000
Diethylphthalate	84-66-2		170	5000

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15C: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Waste/Soil

Analytical Group: TCL Semivolatiles - Concluded

Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 (Low) Quantitation Limits (ug/kg)	Analytical Method – SOM02.4 (Medium) Quantitation Limits (ug/kg)
Fluorene	86-73-7		170	5000
4-Chlorophenyl-phenyl ether	7005-72-3		170	5000
4-Nitroaniline	100-01-6		330	10000
4,6-Dinitro-2-methylphenol	534-52-1		330	10000
N-Nitrosodiphenylamine	86-30-6		170	5000
1,2,4,5-Tetrachlorobenzene	95-94-3		170	5000
4-Bromophenyl-phenylether	101-55-3		170	5000
Hexachlorobenzene	118-74-1		170	5000
Atrazine	1912-24-9		330	10000
Pentachlorophenol	87-86-5		330	10000
Phenanthrene	85-01-8		170	5000
Anthracene	120-12-7		170	5000
Carbazole	86-74-8		330	10000
Di-n-butylphthalate	84-74-2		170	5000
Fluoranthene	206-44-0		330	10000
Pyrene	129-00-0		170	5000
Butylbenzylphthalate	85-68-7		170	5000
3,3'-Dichlorobenzidine	91-94-1		330	10000
Benzo(a)anthraceneF	56-55-3		170	5000
ChryseneF	218-01-9		170	5000
Bis(2-ethylhexyl)phthalate	117-81-7		170	5000
Di-n-octylphthalate	117-84-0		330	10000
Benzo(b)fluorantheneF	205-99-2		170	5000
Benzo(k)fluorantheneF	207-08-9		170	5000
Benzo(a)pyreneF	50-32-8		170	5000
Indeno(1,2,3-cd)pyreneF	193-39-5		170	5000
Dibenzo(a,h)anthraceneF	53-70-3		170	5000
Benzo(g,h,i)peryleneF	191-24-2		170	5000
2,3,4,6-Tetrachlorophenol	58-90-2		170	5000

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15D: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil
Analytical Group: TCL Pesticides
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 Quantitation Limits (ug/kg)
alpha-BHC	319-84-6		1.7
beta-BHC	319-85-7		1.7
delta-BHC	319-86-8		1.7
gamma-BHC (Lindane)	58-89-9		1.7
Heptachlor	76-44-8		1.7
Aldrin	309-00-2		1.7
Heptachlor epoxide	1024-57-3		1.7
Endosulfan I	959-98-8		1.7
Dieldrin	60-57-1		3.3
4,4'-DDE	72-55-9		3.3
Endrin	72-20-8		3.3
Endosulfan II	33213-65-9		3.3
4,4'-DDD	72-54-8		3.3
Endosulfan sulfate	1031-07-8		3.3
4,4'-DDT	50-29-3		3.3
Methoxychlor	72-43-5		17
Endrin ketone	53494-70-5		3.3
Endrin aldehyde	7421-93-4		3.3
alpha-Chlordane	5103-71-9		1.7
gamma-Chlordane	5103-74-2		1.7
Toxaphene	8001-35-2		170

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15E: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (CLP Worksheet)

Matrix: Soil
Analytical Group: TCL PCBs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – SOM02.4 Quantitation Limits (ug/kg)
Aroclor-1016	12674-11-2		33
Aroclor-1221	11104-28-2		33
Aroclor-1232	11141-16-5		33
Aroclor-1242	53469-21-9		33
Aroclor-1248	12672-29-6		33
Aroclor-1254	11097-69-1		33
Aroclor-1260	11096-82-5		33
Aroclor-1262	37324-23-5		33
Aroclor-1268	11100-14-4		33

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15F: Project Action Limits and Laboratory Specific Detection/Quantitation Limits
CLP SOW ISM02.4 (CLP Worksheet)

Matrix: Soil

Analytical Group: TAL Metals, Mercury, and Cyanide

Concentration Level: Low/Medium

Analyte	CAS Number	Action Level*	Analytical Method – ISM02.4 Quantitation Limits (mg/kg)	Analytical Method – ISM02.4 Quantitation Limits (ug/L)
Aluminum	7429-90-5		NA	200
Antimony	7440-36-0		1	60
Arsenic	7440-38-2		0.5	10
Barium	7440-39-3		5	200
Beryllium	7440-41-7		0.5	5
Cadmium	7440-43-9		0.5	5
Calcium	7440-70-2		NA	5000
Chromium	7440-47-3		1	10
Cobalt	7440-48-4		0.5	50
Copper	7440-50-8		1	25
Iron	7439-89-6		NA	100
Lead	7439-92-1		0.5	10
Magnesium	7439-95-4		NA	5000
Manganese	7439-96-5		0.5	15
Nickel	7440-02-0		0.5	40
Potassium	7440-09-7		NA	5000
Selenium	7782-49-2		2.5	35
Silver	7440-22-4		0.5	10
Sodium	7440-23-5		NA	5000
Thallium	7440-28-0		0.5	25
Vanadium	7440-62-2		2.5	50
Zinc	7440-66-6		1	60
Cyanide	57-12-5		0.5	10
Mercury	7439-97-6		0.1	0.2

*Data will be compared with the most current States and/or Federal regulatory limits (see Attachment C).

QAPP Worksheet #15G: Project Action Limits and Laboratory Specific Detection/Quantitation Limits SW-846 Methods

Matrix: Soil
Analytical Group: RCRA Characteristics
Concentration Level: low/Medium

Analyte Description	CAS Number	Reporting Limit	Method Detection Limit (mg/L)
Ignitability, Solids	NA	2.20 burn rate mm/sec	NA
Reactive Cyanide	NA	25 mg/kg	25 mg/kg
Reactive Sulfide	NA	20 mg/kg	19.4 mg/kg
pH	NA	0.1 SU	-

SU-Standard Unit

QAPP Worksheet #15H: Project Action Limits and Laboratory Specific Detection/Quantitation Limits

Matrix: Soil
Analytical Group: Full TCLP
Concentration Level: Low/Medium

TCLP COMPOUND	REGULATORY LEVEL Mg/L[1]	Achievable Quantitation Limit Mg/L[2]
TCLP Volatiles	**CLP SOW SOM02.4**	
Benzene	0.5	
2-Butanone	200	
Carbon Tetrachloride	0.5	
Chlorobenzene	100	
Chloroform	6.0	
1,4-Dichlorobenzene	7.5	
1,2-Dichloroethane	0.5	
1,1-Dichloroethene	0.7	
Tetrachloroethene	0.7	
Trichloroethene	0.5	
Vinyl Chloride	0.2	
TCLP Semi-Volatiles	**CLP SOW SOM02.4**	
m-Cresol and p-Cresol	200	
o-Cresol	200	
Pentachlorophenol	100	
2,3,5-Trichlorophenol	400	
2,4,6-Trichlorophenol	2.0	
1,4-Dichlorobenzene	7.5	
2,4-Dinitrotoluene	0.130	
Hexachlorobenzene	0.130	
Hexachloro-1,3-butadiene	0.5	
Hexachloroethane	3.0	
Nitrobenzene	2.0	
Pyridine	5.0	
TCLP Pesticides	**CLP SOW SOM02.4**	
Lindane	0.4	
Chlordane	0.03	
Endrin	0.02	
Heptachlor	0.008	
Heptachlor Epoxide	0.008	
Methoxychlor	10.0	
Toxaphene	0.5	
TCLP Herbicides	**SW 846 Method 8151**	
2,4-D	0.010	0.00500
2,4,5-TP (Silvex)	0.001	0.00400
TCLP METALS	**CLP SOW ISOM02.4**	
Arsenic	5.0	
Barium	100	
Cadmium	1.0	
Chromium	5.0	
Lead	5.0	
Mercury	0.2	
Selenium	1.0	
Silver	5.0	

[1] Regulatory Levels are those documented in validated methods.

[2] As per CLP SOW, the CRQL for the TCLP analytes are the "low water" CRQLs (Low/Medium volatiles and semivolatiles) and the "water". CRQLs (pesticides) divided by 1000 in units of mg/L
CRQLs (pesticides) divided by 1000 in units of mg/L

QAPP Worksheet #17: Sampling Design and Rationale

All soil sampling activities will be performed in accordance with EPA's ERT/SERAS contractor's SOP No. 2001: *General Field Sampling Guidelines* and SOP No. 2012: *Soil Sampling*. Dedicated nitrile gloves will be donned between sample locations and depth intervals. Dedicated sampling equipment will be utilized for sample collection; therefore, rinsate samples will not be collected. The following sampling design is based on information currently available and may be modified on-site in light of field screening results and other acquired information.

Clean fill samples will be collected at off-site vendor facilities in accordance with NYCRR 375 and NYSDEC DER-10. Three grab clean fill samples for TCL VOCs analysis will be collected directly from the soil stockpile using three Encore™ samplers per grab sample, and one composite clean fill sample comprising of grab samples from each of the three locations will be collected using dedicated stainless steel scoop. The three grab samples will be placed in an aluminum pan and homogenized into one composite sample prior to being placed in recommended glass sample jars for percent moisture, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228, analyses. For QA/QC purposes, field duplicate and additional sample volumes designated for matrix MS/MSD will be collected.

Using non-dedicated stainless steel hand augers, soil boring will be advanced to depths 2 feet bgs at a location to be determined on-site by the EPA OSC. Two grab disposal samples comprising a heterogeneous mix of soil/slag/rock will be collected at depths 0 to 12 inches bgs and 12 to 24 inches bgs, respectively. At each sampling depth interval, one grab disposal sample for TCL VOCs analysis will be collected directly from the auger bucket using three Encore™ samplers. Samples for all other analytical parameters will be collected with the hand auger, placed in aluminum pan and homogenized prior to being placed in recommended glass sample jars for laboratory analysis including percent moisture, TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, cyanide, TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, RCRA characteristics (ignitability, reactive cyanide, reactive sulfide, pH), and radiological parameters including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain, other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth, and alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Field duplicate and MS/MSD samples will not be collected for TCLP and RCRA analyses.

QAPP Worksheet #17: Sampling Design and Rationale (Concluded)

The following laboratories will provide the analyses indicated:

Lab Name/Location	Sample Type	Parameters
Eurofins TestAmerica Laboratories, Inc. 13715 Rider Trail North Earth City, MO 63045 RFP# 612 (non-CLP Lab)	Soil/Slag/Rocks (Clean fill and Disposal Soils)	Gamma spectrometry, Alpha Spectrometry; and Isotopic Uranium and Thorium (ICP-MS)
		TCLP Herbicides and RCRA Characteristics
Bonner Analytical Testing Company 2703 Oak Grove Road Hattiesburg, MS 39402 Phone Number: 601-264-2854 Laboratory Contact: Max Bonner CLP Case #: 48550 (CLP Lab)	Soil/Slag/Rocks (Clean fill and Disposal Soils)	TAL Metals, including Mercury and Cyanide, and TCLP Metals including Mercury
Chemtech Consulting Group 284 Sheffield Street Mountainside, NJ 07092 Phone: 908-728-3154 CLP Case#: 48550 (CLP Lab)	Soil/Slag/Rocks (Clean fill and Disposal Soils)	Full TCL, TCLP Volatile, TCLP Semivolatile, and TCLP Pesticides

Refer to Worksheet #20 for QA/QC samples, sampling methods, and SOPs.

QAPP Worksheet #18: Sampling Locations and Methods/SOP Requirements Table

The following information is project-specific and will be included in the site-specific QAPP.

Sampling Location	Matrix	(Units)	Sample Type No. of Samples (identify field duplicates)	Analyte/Analytical Group(s)	Sampling SOP Reference[1]	Comments
4	Clean fill / Disposal Soil	mg/kg or µg/kg	Up to 5 grab samples (2)	TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals including mercury, and cyanide	SOP# 2001 SOP# 2012 NYSDEC DER-10	To verify if the fill material meets the requirements of the NYSDEC UUSCO in accordance with NYCRR 375 and determine composition of site soil for disposal purposes
4	Clean fill / Disposal Soil	pCi/g	Up to 3 grab samples (2)	Isotopic Thorium, Isotopic Uranium, and other alpha emitting actinides. Radium-226, Radium-228 and other gamma emitting radioisotopes		
1	Disposal Soil[2]	mg/L or µg/L	Up to 2 grab samples (0)	Full TCLP		Determine composition of site soil for disposal purposes
		mg/kg or µg/kg		RCRA Characteristics		

[1]The website for EPA's ERT/SERAS SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107
The website for NYSDEC DER-10 is: http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf
[2]Samples for Full TCLP and RCRA Characteristics will be collected for screening purposes only, therefore, MS/MSD and field duplicate samples will not be collected.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)	Data Package Turnaround Time
Clean Fill/ Disposal Soil	TCL VOC % Moisture	CLP SOW SOM02.4, CLP Sampler's Guide	(3) Encore Samplers (1) 4 oz. glass jar w/Teflon lined cap	3 Encores 10 grams/each	Cool to 4°C	14 Days	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	TCL SVOC	CLP SOW SOM02.4, CLP Sampler's Guide	(1) 4 oz. glass jar w/Teflon lined cap	60 grams	Cool to 4°C	14 Days Extract 40 Days Analysis	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	TCL Pesticides	CLP SOW SOM02.4, CLP Sampler's Guide	(1) 4 oz. glass jar w/Teflon lined cap	60 grams	Cool to 4°C	14 Days	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	PCBs	CLP SOW SOM02.4, CLP Sampler's Guide	(1) 4 oz. glass jar w/Teflon lined cap	60 grams	Cool to 4°C	14 Days	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	TAL Metals + Mercury	CLP SOW ISM02.4, CLP Sampler's Guide	(1) 4 oz. glass jar w/Teflon lined cap	10 grams 25 grams	Cool to 4°C	180 Days 28 Days	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	Cyanide	CLP SOW ISM02.4, CLP Sampler's Guide	(1) 4 oz. glass jar w/Teflon lined cap	10 grams	Cool to 4°C	14 Days	21 Days Preliminary Data, and Final Data
Disposal Soil	TCLP Herbicides	Method 8151A	(1) 8 oz. glass jar w/Teflon lined cap	60 grams	Cool to 4°C	14 Days Extract 40 Days Analysis	21 Days Preliminary Data, and Final Data
Clean Fill/ Disposal Soil	Gamma Spec	EPA 901.1 / ST-RD-0102	1x16oz. plastic or glass	400g	None	None	21 Days Preliminary Data, and Final Data
	Alpha Spec	HASL 300 A-01-R / ST-RD-0210	Included with Gamma spec	2g	None	None	21 Days Preliminary Data, and Final Data
	ICPMS	SW846 3050B & 6020A / ST-MT-0001	Included with Gamma Spec	2g	None	180 Days	21 Days Preliminary Data, and Final Data

[1]The website for EPA's ERT/SERAS SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107
[2] The minimum sample size is based on analysis allowing for sufficient sample for reanalysis. Additional volume is needed for the laboratory Matrix Spike/Matrix Spike Duplicate sample analysis.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times (Concluded)

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)	Data Package Turnaround Time
Disposal Soil	TCLP VOC	SOM02.4	(1) Encore Sampler	25 grams	Cool to 4°C	14 days (sampling to TCLP ZHE extraction)	21 Days Preliminary Data, and Final Data
Disposal Soil	TCLP Organic extractables: SVOC, Pesticide, (any or all)	SOM02.4	(1) 8-oz. wide mouth glass jar with PTFE lined lid	60 grams	Cool to 4°C	14 days (sampling to TCLP extraction) and 7 days (TCLP extraction to organic extraction for SVOCs, pesticides)	21 Days Preliminary Data, and Final Data
Disposal Soil	TCLP Metals including mercury	ISM02.4	(1) 8-oz. wide mouth glass jar with PTFE lined lid	60 grams	Cool to 4°C	Mercury: 28 days (sampling to TCLP extraction) Other metals: 180 days (sampling to TCLP extraction)	21 Days Preliminary Data, and Final Data
Disposal Soil	*RCRA Characteristics	SW 846 Methods: 9012A, 9034, 1030, and 9045C	(1) 8 oz. glass jar w/Teflon lined cap	60 grams	Cool to 4°C	pH: ASAP Ignitability: NA Rec. CN: 14 days Rec. S: 7 days	21 Days Preliminary Data, and Final Data

* No sample preservation is required, but sample containers should be completely filled and tightly sealed to preserve sample integrity.

QAPP Worksheet #20: Field Quality Control Sample Summary

Matrix	Analytical Group	No. of Field Samples	No. of Field Duplicates	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Field Blanks	No. of Equip. Blanks	No. of Trip. Blanks	No of others	Total No. of Samples to Lab
Clean Fill/ Disposal Soil	TCL VOC	3+2	1+1	1+1	NR	NR	NR	NR	9
Clean Fill/ Disposal Soil	TCL SVOC	1+2	1+1	1+1	NR	NR	NR	NR	7
Clean Fill/ Disposal Soil	TCL Pesticides	1+2	1+1	1+1	NR	NR	NR	NR	7
Clean Fill/ Disposal Soil	TCL PCBs	1+2	1+1	1+1	NR	NR	NR	NR	7
Clean Fill/ Disposal Soil	TAL Metals + Hg	1+2	1+1	1+1	NR	NR	NR	NR	7
Clean Fill/ Disposal Soil	Cyanide	1+2	1+1	1+1	NR	NR	NR	NR	7
Clean Fill/ Disposal Soil	Radiological Parameters	1+2	1+1	1+1	NR	NR	NR	NR	7
Disposal Soil	TCLP Metals + Hg	2	NR	NR	NR	NR	NR	NR	2
Disposal Soil	TCLP VOC	2	NR	NR	NR	NR	NR	NR	2
Disposal Soil	TCLP SVOC	2	NR	NR	NR	NR	NR	NR	2
Disposal Soil	TCLP Pesticides	2	NR	NR	NR	NR	NR	NR	2
Disposal Soil	TCLP Herbicides	2	NR	NR	NR	NR	NR	NR	2
Disposal Soil	RCRA Characteristics	2	NR	NR	NR	NR	NR	NR	2

NR – Not Required

QAPP Worksheet #21: Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comment
SOP #2001	General Field Sampling Guidelines (all media); Rev. 0.0 August 1994	EPA's ERT/SERAS	Encore® Samplers, stainless steel scoops and augers, glass sample jars, re-sealable plastic bags	N	--
SOP # 2012	Soil Sampling; Rev.01, July 2001	EPA's ERT/SERAS	Encore® Samplers, stainless steel scoops and augers, glass sample jars, re-sealable plastic bags	N	--

See Attachment B for EPA's ERT/SERAS SOP #s 2001 and 2012
https://response.epa.gov/site/site_profile.aspx?site_id=2107

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Trimble® GeoXT™ handheld GPS	Factory-calibrated by Manufacturer	Charge battery when low	Confirm optimum satellite reception and battery status	Charge battery at least daily	For data accuracy, the unit should receive communication from at least 5 satellites	Charge battery when low or replace battery if it does not hold charge	EPA Equipment office	Not applicable
*Ludlum Model 2241 with 3x3 Gamma Scintillator	Factory-calibrated by Manufacturer	Replace battery when low	Turn on instrument to confirm sensitivity	As needed	Instrument reads background	EPA Equipment office	EPA Equipment office	Not applicable

*Equipment provided, calibrated, maintained, tested, and inspected by EPA.

QAPP Worksheet #23: Analytical SOPs

Reference Number	Title, Revision Date, and/or Number and URL (if available)	Definitive or Screening Data	Analytical Group	Instrument	Modified for Project Work? (Y/N)*
SOM02.4	SOM02.4 USEPA Contract Laboratory Program Statement of Work for Multi-Media, Multi-Concentration Organic Analysis,; October 2016 https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows	Definitive	Target Compound List/TCLP Volatiles and Semi-Volatile Organics	GC/MS	NO
SOM02.4	SOM02.4 USEPA Contract Laboratory Program Statement of Work for Multi-Media, Multi-Concentration Organic Analysis,; October 2016 https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows	Definitive	Target Compound List Pesticide/ TCLP Pesticides	GC/ECD	NO
SOM02.4	SOM02.4 USEPA Contract Laboratory Program Statement of Work for Multi-Media, Multi-Concentration Organic Analysis,; October 2016 https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows	Definitive	Target Compound List PCBs	GC/ECD	NO
ISM02.4	ISOM02.4 USEPA Contract Laboratory Program Statement of Work for Multi-Media, Multi-Concentration Inorganic Analysis,; December 2016 https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows	Definitive	Target Analyte List Metals, Mercury, and Cyanide	ICP-AES / ICP-MS/CVAA/	NO
AP-011 AP-018	Gamma Spectroscopy Operation, Rev-20, 5/31/17 Operation of the Alpha Spectroscopy Systems Rev-19, 5/31/17	Definitive	Radiological parameters-Gamma Spectroscopy	Canberra	NO
AP-002 & AP-005	Sample Preparation Rev21, 10/29/16 & Alpha Isotopic Analyses, Rev-20, 10/31/16	Definitive	Radiological parameters-Alpha Spectroscopy	Canberra	NO

QAPP Worksheet #23: Analytical SOPs (Concluded)

Reference Number	Title, Revision Date, and/or Number and URL (if available)	Definitive or Screening Data	Analytical Group	Instrument	Modified for Project Work? (Y/N)*
SW-846 8151A	METHOD 8151A CHLORINATED HERBICIDES BY GIC USING METHYLATION OR PENTAFLUOROBENZYLATION DERIVATIZATION https://www.epa.gov/sites/production/files/2015-12/documents/8151a.pdf	Screening	Soil	GC	NO
SW-846 1030	METHOD 1030 IGNITABILITY OF SOLIDS https://www.epa.gov/sites/production/files/2015-12/documents/1030.pdf	Screening	Soil	Burner with propane gas and air, thermometer, and Anemometer	NO
SW-846 9012B	METHOD 9012B TOTAL AND AMENABLE CYANIDE (AUTOMATED COLORIMETRIC, WITH OFF-LINE DISTILLATION) https://www.epa.gov/sites/production/files/2015-12/documents/9012b_0.pdf	Screening	Soil	Colorimetric	NO
SW-846 9034	METHOD 9034 TITRIMETRIC PROCEDURE FOR ACID-SOLUBLE AND ACID INSOLUBLE SULFIDES https://www.epa.gov/sites/production/files/2015-12/documents/9034.pdf	Screening	Soil	Titrimetric	NO
SW-846 9045D	METHOD 9045D SOIL AND WASTE pH https://www.epa.gov/sites/production/files/2015-12/documents/9045d.pdf	Screening	Soil	pH Meter	NO

* If yes, explain the modification

QAPP Worksheet #24: Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	See SOM02.4	Initial calibration: upon award of the contract, whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.), or if the continuing calibration acceptance criteria have not been met. Continuing calibration: Once every 12 hours	Initial calibration/ Continuing calibration: relative response factor (RRF) greater than or equal to minimum acceptable response factor listed in Table 5 of procedure; %RSD must be less than or equal to value listed in Table 5 of procedure.	Initial calibration: inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate. Continuing calibration: inspect system, recalibrate the instrument, and reanalyze samples.	EPA CLP RAS Laboratory GC/MS Technician	SOM02.4
GC/ECD	See SOM02.4	Initial calibration: upon award of the contract, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met. Calibration verification: Once every 12 hours	Initial calibration/ Calibration verification: resolution between two adjacent peaks must be greater than or equal to 60.0 percent, single components must be greater than or equal to 90.0 percent resolved, RTs within the RT window, %D must be greater than or equal to -25 percent and less than or equal to 25 percent, %RSD must be less than or equal to 20.0 percent.	Initial calibration: inspect the system (e.g., change the column, bake out the detector, clean the injection port) , correct problem, re-calibrate. Calibration verification: inspect system, recalibrate the instrument, and reanalyze samples.	EPA CLP RAS Laboratory GC/ECD Technician	SOM02.4

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-AES / ICP-MS	See ISM02.4; as per instrument manufacturer's recommended procedures	ICP-AES or ICP-MS Initial calibration: daily or once every 24 hours and each time the instrument is set up. ICP-AES or ICP-MS Continuing calibration: beginning and end of run, and frequency of 10% or every 2 hours during an analysis run.	ICP-AES: As per instrument manufacturer's recommended procedures, with at least 2 standards. ICP-MS: As per instrument manufacturer's recommended procedures, with at least 2 standards. A minimum of three replicate integrations are required for data acquisition.	ICP-AES or ICP-MS: inspect the system, correct problem, re-calibrate, and re-analyze samples.	EPA CLP RAS Laboratory ICP-AES / ICP-MS Technician	ISM02.4
CVAA	See ISM02.4; as per instrument manufacturer's recommended procedures	Daily initial calibration prior to sample analysis. Continuing calibration standards at the frequency specified in the method.	$r^2 \geq 0.995$ for linear regression	Correct problem then repeat initial calibration. If calibration fails again, re-digest the entire digestion batch.	Lab Manager/ Analyst	ISM02.4
Colorimeteric	9012B	Daily initial calibration prior to sample analysis. Continuing calibration standards at the frequency specified in the method.	$r^2 \geq 0.995$ for linear regression	Correct problem then repeat initial calibration. If calibration fails again, re-digest the entire digestion batch.	Lab Manager/ Analyst	TBD
Titrimetric	9034	Daily initial calibration prior to sample analysis. Continuing calibration standards at the frequency specified in the method.	$r^2 \geq 0.995$ for linear regression	Correct problem then repeat initial calibration. If calibration fails again, re-digest the entire digestion batch.	Lab Manager/ Analyst	TBD

[1] Refer to the Analytical SOPs table (Worksheet 23). A laboratory-specific QA Manual may be referenced on a project-specific basis and will be identified in the site specific QAPP.
CVAA = Cold Vapor Atomic Absorption
GC/ECD = Gas Chromatograph/Electron Capture Detector
GC/MS = Gas Chromatograph/Mass Spectrometer
ICP-AES = Inductively Coupled Plasma-Atomic Emission Spectrometer

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gamma Spectrometer	Initial Calibration Verification (ICAL) for Energy, Efficiency, and FWHM peak resolution	Prior to initial use, following repair or loss of control and upon incorporation of new or changed instrument settings	Peak energy difference is within 0.1 keV of reference energy for all points. Peak FWHM < 2.5 keV at 1332 keV. Energy vs channel slope equation shall be linear and accurate to 0.5 keV	Correct problem, then repeat ICAL.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Initial Calibration Verification (ICV)	After ICAL for energy/efficiency and prior to analysis of samples.	Observed peaks of second source standard fall within ± 10% of initial calibration value relative to the true value.	Verify second source standard and repeat ICV to check for errors. If that fails, identify and correct problem and repeat ICV or ICAL and ICV as appropriate.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Continuing Calibration Verification (CCV) (Daily Check)	Daily or prior to use. When working with long count times or batch sequences that run more than a day, CCV is performed at the beginning and end of each analytical batch as long as it not longer than a week.	Energy: ±0.5 keV at 60 keV; ± .75 keV at 1332 keV. FW HM: ±1.2x at 60 keV; ±1.8x at 662 keV; ±2.3x at 1332 keV. Activity Difference: %difference between the source activity and the reported activity ±5%	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Background Subtraction Count Measurement (BSC) (Long count for subtracting background from blanks or test sources)	Immediately after ICAL and then performed on at least a monthly basis.	Background count rate of the entire spectrum with ±3σ of the average.	Recount and check control chart for trends. Determine cause, correct problem, re-establish BSC. If background activity has changed, re-establish BSC and reanalyze or qualify all impacted samples since last acceptable BSC.	Lab Manager / Analyst	ST-RD-0102

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gamma Spectrometer	Instrument Contamination Check (ICC) (Short count for controlling gross contamination)	Daily or when working with long count times before and after each analytical batch. Check after counting high activity samples.	No extraneous peaks identified (i.e., no new peaks in the short background spectrum compared to previous spectra); Background count rate of the entire spectrum with ±3σ of the average.	Recount the background. If still out of control, locate and correct problem; reanalyze or qualify all impacted samples since last acceptable ICC. If background activity has changed, re-establish BSC and reanalyze samples.	Lab Manager / Analyst	ST-RD-0102
Alpha Spectrometer	Initial Calibration (ICAL) (Energy, efficiency and FWHM peak resolution)	Prior to initial use, following repair or loss of control and upon incorporation of new or changed instrument settings.	3 isotopes within energy range of 3-6 MeV. Energy vs. channel slope equation <15 keV per channel. Full Width –Half Maximum (FWHM) <100 keV for each peak used for calibration. Minimum of 3,000 net counts in each peak.	Correct problem, then repeat ICAL.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Initial Calibration Verification (ICV)	After initial calibration.	FWHM ≤100 keV ; Each peak within ±40 keV of corresponding calibration peaks in initial energy calibration. Minimum 2000 net counts. Efficiency within 95% - 105% of initial calibration value.	Repeat ICV to check for error. If that fails, identify and correct problem and repeat ICV or ICAL and ICV, as appropriate.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Continuing Calibration Verification (CCV) (Pulser check)	Pulser verification daily, prior to analysis of samples.	Observed peak centroid falls ≤ 20 keV from reference energy.	Recount and check control chart for trends. Determine cause, correct problem, and repeat CCV and all associated samples since last successful CCV.	Lab Manager / Analyst	ST-RD-0210

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Alpha Spectrometer	Continuing Calibration Verification (CCV) (Check source)	Weekly source check verification prior to analysis of samples.	FWHM ≤100 keV; Each peak within ±40 keV of corresponding calibration peaks in initial energy calibration. Minimum 2000 net counts. Efficiency within 95% - 105% of initial calibration value.	Recount and check control chart for trends. Determine cause, correct problem, and repeat CCV and all associated samples since last successful CCV.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Background Subtraction Count (BSC) Measurement	Prior to initial use or after initial calibration and monthly.	Use a statistical test to determine a change in the background count rate value.	Check control chart for trends and recount. Determine cause, correct problem, re-establish BSC. If background activity has changed, re-establish BSC and reanalyze all impacted samples since last acceptable BSC.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Instrument Contamination Check (ICC)	Performed weekly, at minimum, and after counting high activity samples.	Within ±3σ of mean activity of recent BSC's (minimum of 3 BSCs)	Check control chart for trends and recount. Determine cause and correct problem. Background activity has changed, re-establish BSC and reanalyze all infected samples.	Lab Manager / Analyst	ST-RD-0210
ICP-MS	Linear Dynamic Range (LDR) or high-level check standard	At initial set up and checked every 6 months high a high standard at the upper limit of the range	Within + 10% of true value	Dilute samples within the calibration range, or re-establish/verify the LDR	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Tuning	Prior to ICAL	Mass calibration < 0.1 amu from the true value; Resolution < 0.9 amu full width at 10% peak height	Retune instrument and verify	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Initial Calibration (ICAL) – minimum one high standard and a calibration blank	Daily initial calibration prior to sample analysis	3 standards and a blank. Correlation Coefficient of ≥ 0.998	Recalibrate	Lab Manager / Analyst	ST-MT-0001

QAPP Worksheet #24: Analytical Instrument Calibration Table (Concluded)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-MS	Initial Calibration (ICAL) – minimum one high standard and a calibration blank	Daily initial calibration prior to sample analysis	3 standards and a blank. Correlation Coefficient of ≥ 0.998	Recalibrate	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected	Recalibrate	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence	All analytes within + 10% of expected value	Recalibrate – rerun 10 samples previous to failed CCV.	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Calibration Blanks (ICB/CCB)	After ICV (ICB) and after every CCV (CCB)	All analytes less than RL	Correct problem and rerun ICB or CCB and all bracketing samples	Lab Manager / Analyst	ST-MT-0001
ICP-MS	Interference Check Solutions (ICS)	After ICAL and prior to sample analysis	ICS-A: Absolute value of concentration for all non-spiked project analytes < LOD (unless they are a verified trace impurity from one of the spike analytes). ICS-AB: within + 20% of true value	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples	Lab Manager / Analyst	ST-MT-0001

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person for CA	SOP Reference[1]
GC/MS	See SOM02.4; as per instrument manufacturer's recommendations	See SOM02.4; as per instrument manufacturer's recommendations	See SOM02.4; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM02.4	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP RAS Laboratory GC/MS Technician	TBD
GC/ECD	See SOM02.4; as per instrument manufacturer's recommendations	See SOM02.4; as per instrument manufacturer's recommendations	See SOM02.4; as per instrument manufacturer's recommendations	Acceptable re-calibration; see SOM02.4	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP RAS Laboratory GC/ECD Technician	TBD
ICP-AES / ICP-MS	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see ISM02.4	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA CLP RAS Laboratory ICP-AES / ICP-MS Technician	TBD
CVAA (Mercury)	Pump tubing, absorption cell and lens cleaning	Sensitivity check. Passing calibrations: ISM02.4 EPA 7470A EPA 7471B EPA 245.1	Check connections, flush sample lines	As specified by method	Perform maintenance, check standards, recalibrate	Laboratory Analyst	TBD
Colorimetric	Pump, tubing, maintenance	Passing calibrations: ISM02.4 EPA 9012B	Clean or replace tubing, check connections	As specified by method	Per method criteria: Passing ICAL and CCVs	Perform maintenance, check standards, recalibrate	TestAmerica Analyst
Gamma Spectrometer	1. Clean cave; fill dewar with N2	1. Physical check	1. Physical check	1. Weekly	1. Acceptable background	Recalibrate	TestAmerica Analyst
Gamma Spectrometer	2. QA check	2. Background and source check	2. Check deviation	2. Daily	2. Within 3 sigma of measured population	Instrument maintenance and consult with Technical director	TestAmerica Analyst

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Concluded)

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person for CA	SOP Reference[1]
Alpha Spectrometer	1. Clean planchette holders	1. Physical check	1. Physical check	1. Monthly	1. Acceptable background and calibration efficiencies	Recalibrate	TestAmerica Analyst
Alpha Spectrometer	2. Pulser check and background checks	2. Background and source check	2. Check deviation	2. Daily	2. Pulser energy, centroid peak, resolution area peak, calibration and background must pass statistical boundary out-of-range test.	Instrument maintenance and consult with Technical director	TestAmerica Analyst
ICP/MS	Replace disposables, clean/change nebulizer, torch, and cones	Tuning	Instrument performance and sensitivity	As needed	Tune, ICV, and CCV pass criteria	Recalibrate	TestAmerica Analyst

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal

Sampling Organization: Weston Solutions, Inc., START V
Laboratories: Chemtech Consulting Group, 284 Sheffield Street, Mountainside, NJ 07092 – CLP Laboratory [TCL and TCLP Organic analyses (except TCLP Herbicides)]
Chemtex, 3082 25th Street, Port Arthut, TX 77642 – CLP Laboratory [TAL Metals + Hg + CN and TCLP Metals + Hg Inorganic analyses]
Eurofins TestAmerica, 13715 Rider Trail North, Earth City, MO 63045 – non-CLP Laboratory [Radiochemistry (alpha & Gamma spectroscopy), TCLP Herbicides, and RCRA Characteristics]
Method of sample delivery (shipper/carrier): Hand Delivered or FedEx
Number of days from reporting until sample disposal: 60 days

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference[1]
Sample Labeling	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Chain-of-Custody Form Completion	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Sample Packaging	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Shipping Coordination	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	EPA-540-R-014-013, October 2014
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	EPA-540-R-014-013, October 2014
Sample Disposal	Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	EPA-540-R-014-013, October 2014

Sample Identification Procedures: Each sample collected by START V will be designated by a code that will identify the sample in accordance with previous sampling (if applicable). An alpha-numeric code that identifies the site-specific property number will begin the sample nomenclature, followed by media type and location. Duplicate samples will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

Example Sample Naming Nomenclature for clean fill: CF001-GRAB01-01 and CF001-COMP01-01
CF001- Clean fill Facility Identification Number; GRAB01- Grab Sample Location 01; COMP01- Composite Sample Location 01;
01- First Sample; Field Duplicate will be identified in the same manner, but will be the next sequential sample number (02)

Example Sample Naming Nomenclature for disposal soil: UMR001-DS01-0012-01
UMR001- Site Identification Number; DS001- Disposal Sample Location 01; 0012- Sample Depth at 0 to 12 inches bgs;
01- First Sample; Field Duplicate will be identified in the same manner, but will be the next sequential sample number (02)

.QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal (Concluded)

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Each sample will be individually identified and labeled after collection, then sealed with custody seals and enclosed in a plastic cooler. The sample information will be COC forms, and the samples shipped to the appropriate laboratory via overnight delivery service or courier. Chain-of-custody records must be prepared in Scribe to accompany samples from the time of collection and throughout the shipping process. Each individual in possession of the samples must sign and date the sample COC Record. The chain-of-custody record will be considered completed upon receipt at the laboratory. A traffic report and chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook. The chain-of-custody record should include (at minimum) the following: 1) Sample identification number; 2) Sample information; 3) Sample location; 4) Sample date; 5) Sample Time; 6) Sample Type Matrix; 7) Sample Container Type; 8) Sample Analysis Requested; 9) Name(s) and signature(s) of sampler(s); and 10) Signature(s) of any individual(s) with custody of samples.

A separate chain-of-custody form must accompany each cooler for each daily shipment. The chain-of-custody form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the chain-of-custody for all samples in case of mis-shipment.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. At this time, no samples will be archived at the laboratory. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

[1]Note: Refer to Contract Laboratory Program Guidance for Field Samplers, EPA-540-R-014-013, October 2014 at:
https://www.epa.gov/sites/production/files/2015-03/documents/samplers_guide.pdf

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A1: Radiochemistry - Gamma Spectroscopy (non-CLP Worksheet)

Matrix	Soil
Analytical Group	Gamma Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	EPA Method 901.1
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica Laboratories
No. of Sample Locations	3

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No target analytes detected > target detection limit	Correct problem. If required, re-prepare and reanalyze MB and all samples processed with the contaminated blank.	Analyst, Supervisor	Accuracy/Bias/ Contamination	No target analytes detected > target detection limit
LCS	One per preparation batch	Recovery limits: 87-120% for Cs-137, 87-115% for Co-60, 87-116% for Am-241	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Supervisor	Accuracy/Bias	Target analytes must be within recovery limits
Duplicate	One per preparation batch	RPD limit of 40% or DER < 3	Correct problem, then re-prepare and reanalyze all samples in the associated preparatory batch, if not excursion not cuased by sample matrix.	Analyst, Supervisor	Precision/ Accuracy/Bias	The absolute value of the sample analyte result minus the duplicate analyte result divided by the square root of the sum of the squares of the sample and duplicate one-sigma analyte uncertainties must be less than 3.0

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A2: Radiochemistry - Alpha Spectroscopy (non-CLP Worksheet)

Matrix	Soil
Analytical Group	Alpha Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	HASL-300/A-01-R
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica Laboratories
No. of Sample Locations	3

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No analytes detected > target detection limit	Correct problem. If required, re-prepare and reanalyze MB and all samples processed with the contaminated blank.	Analyst, Supervisor	Accuracy/Bias/ Contamination	No target analytes detected > target detection limit
LCS	One per preparation batch	Recovery limits: 84-120% for U-234 and 82-122% forU-238 Recovery limits: 81-118% for Th-230	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Supervisor	Accuracy/Bias	Target analytes must be within recovery limits
Duplicate	One per preparation batch	RPD limit of 40% or DER < 3	Correct problem, then re-prepare and reanalyze all samples in the associated preparatory batch, if not excursion not cuased by sample matrix.	Analyst, Supervisor	Precision/ Accuracy/Bias	The absolute value of the sample analyte result minus the duplicate analyte result divided by the square root of the sum of the squares of the sample and duplicate one-sigma analyte uncertainties must be less than 3.0

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A2: Radiochemistry - Alpha Spectroscopy (non-CLP Worksheet), Concluded

Matrix	Soil
Analytical Group	Alpha Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	HASL-300/A-01-R
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica Laboratories
No. of Sample Locations	3

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tracer (U-232 and Th-229)	Every Sample	Recovery limits of 30-110%	Truncate tracers above 100% recovery to eliminate low biased results. Reprep and reanalyze sample if carrier is low (indicating high biased results) if there is activity in the sample above the reporting limit. No reanalysis if matrix interference is noticed during sample preparation.	Analyst, Supervisor	Accuracy/Bias	Tracer yield within recovery limits

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A3: Radiochemistry - ICPMS (non-CLP Worksheet)

Matrix	Soil
Analytical Group	ICPMS
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	EPA Method 6020A
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica Laboratories
No. of Sample Locations	3

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No target analytes detected greater than one-half RL and 1/10 the amount measured in any sample or 1/10 regulatory limit (whichever is greater). No laboratory common contaminants detected greater than RL.	Correct problem, then re-reanalyze method blank and all samples processed with the contaminated blank	Lab Manager/ Analyst	Representativeness	Acceptable results per stated QC Acceptance Limits
LCS	One LCS or per preparation batch	Recovery limits of 80-120% for isotopic uranium and 70-130% for Thorium	Correct problem, then re-prep and re-reanalyze the LCS and all associated batch samples for failed analytes, if sufficient sample volume is available and samples are within 2x the hold time. Qualify data accordingly if reprep & re-analysis cannot be performed or if reprep & reanalysis also has failed analytes	Lab Manager/ Analyst	Accuracy	Target analytes must be within recovery limits

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A3: Radiochemistry - ICPMS (non-CLP Worksheet), Concluded

Matrix	Soil
Analytical Group	ICPMS
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	EPA Method 6020A
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica Laboratories
No. of Sample Locations	3

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS/MSD	One MS/MSD pair per preparation batch per matrix	Recovery limits of 75-125% for isotopic uranium and 50-150% for Thorium. RPD limit of 30%	Identify problem; if not related to matrix interference, re-reanalyze MS/MSD and all associated batch samples	Lab Manager/ Analyst	Precision/Accuracy	Target analytes must be within recovery limits
Serial dilution	Each new sample matrix	1:5 dilution must agree within ±10% of original determination.	Perform post-digestion spike if serial diltion does not meet criteria	TestAmerica - St. Louis Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination.
Post-digestion spike	When serial dilution or matrix spike fails	Recovery within 80-120%	Re-analyze post-digestion spike.	TestAmerica - St. Louis Analyst	Accuracy	Within recovery limits

QAPP Worksheet #28: QC Samples Table
Worksheet # 28B: Volatile - Organics/CLP SOM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Volatile Organics
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	59-172 %R	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	1,1-Dichloroethene	59-172 %R
		Trichloroethene	62-137 %R				Trichloroethene	62-137 %R
		Benzene	66-142 %R				Benzene	66-142 %R
		Toluene	59-139 %R				Toluene	59-139 %R
		Chlorobenzene	60-133 %R				Chlorobenzene	60-133 %R
Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	0-22 %RPD	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Precision	1,1-Dichloroethene	0-22 %RPD
		Trichloroethene	0-24 %RPD				Trichloroethene	0-24 %RPD
		Benzene	0-21 %RPD				Benzene	0-21 %RPD
		Toluene	0-21 %RPD				Toluene	0-21 %RPD
		Chlorobenzene	0-21 %RPD				Chlorobenzene	0-21 %RPD
Deuterated Monitoring Compounds	all samples	Vinyl chloride-d3	30-150 %R	Check calculations and instruments, reanalyze affected samples up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45/SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	Vinyl chloride-d3	30-150 %R
		Chloroethane-d5	30-150 %R				Chloroethane-d5	30-150 %R

*with the exception of methylene chloride, 2-butanone & acetone which can be up to 2 times the CRQL. (USEPA CLP Nat'l Fuctional Guidelines, Final, July 2007)

QAPP Worksheet #28: QC Samples Table
Worksheet # 28B: Volatile - Organics/CLP SOM02.4 (Continued)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Volatile Organics [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Deuterated Monitoring Compounds [cont'd]	all samples	1,1-Dichloroethene-d2	45-110 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45 of SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	1,1-Dichloroethene-d2	45-110 %R
		2-Butanone-d5	20-135 %R				2-Butanone-d5	20-135 %R
		Chloroform-d	40-150 %R				Chloroform-d	40-150 %R
		1,2-Dichloroethane-d4	70-130 %R				1,2-Dichloroethane-d4	70-130 %R
		Benzene-d6	20-135 %R				Benzene-d6	20-135 %R
		1,2-Dichloropropane-d6	70-120 %R				1,2-Dichloropropane-d6	70-120 %R
		Toluene-d8	30-130 %R				Toluene-d8	30-130 %R
		trans-1,3-Dichloropropene-d4	30-135 %R				trans-1,3-Dichloropropene-d4	30-135 %R
		2-Hexanone-d5	20-135 %R				2-Hexanone-d5	20-135 %R
		1,4-Dioxane-d8	50-150 %R				1,4-Dioxane-d8	50-150 %R
		1,1,2,2-Tetrachloroethane-d2	45-120 %R				1,1,2,2-Tetrachloroethane-d2	45-120 %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28B: Volatile - Organics/CLP SOM02.4 (Concluded)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Volatile Organics [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Deuterated Monitoring Compounds [cont'd]	all samples	1,2-Dichlorobenzene-d4	75-120 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45/VOC of SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	1,2-Dichlorobenzene-d4	70-120 %R
Internal Standards	all samples	50-200% of area, ± 30 sec retention time shift		Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45/VOC of SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	50-100% of area, ± 30 sec retention time shift	

QAPP Worksheet #28: QC Samples Table
Worksheet # 28C: Semivolatile - Organics/CLP SOM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Semivolatile Organics
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL*		Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	Phenol	26-90 %R	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	Phenol	26-90 %R
		2-Chlorophenol	25-102 %R				2-Chlorophenol	25-102 %R
		N-Nitroso-di-n-propylamine	41-126 %R				N-Nitroso-di-n-propylamine	41-126 %R
		4-Chloro-3-methylphenol	26-103 %R				4-Chloro-3-methylphenol	26-103 %R
		Acenaphthene	31-137 %R				Acenaphthene	31-137 %R
		4-Nitrophenol	11-114 %R				4-Nitrophenol	11-114 %R
		2,4-Dinitrotoluene	28-89 %R				2,4-Dinitrotoluene	28-89 %R
		Pentachloro-phenol	17-109 %R				Pentachloro-phenol	17-109 %R
		Pyrene	35-142 %R				Pyrene	35-142 %R
Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	Phenol	0-35 %RPD	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Precision	Phenol	0-35 %RPD
		2-Chlorophenol	0-50 %RPD				2-Chlorophenol	0-50 %RPD
		N-Nitroso-di-n-propylamine	0-38 %RPD				N-Nitroso-di-n-propylamine	0-38 %RPD

*with the exception of bis (2-Etheylhexyl) phthalate which can be up to 5 times the CRQL. (USEPA CLP Nat'l Fuctional Guidelines, Final, July 2007)

QAPP Worksheet #28: QC Samples Table
Worksheet # 28C: Semivolatile - Organics/CLP SOM02.4 (Continued)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Semivolatile Organics [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Matrix Spike Duplicate (Not Required) [cont'd]	1 per $\leq$ 20 samples; if requested	4-Chloro-3-methylphenol	0-33 %RPD	Flag outliers	EPA CLP RAS Laboratory GC/MS Technician	Precision	4-Chloro-3-methylphenol	0-33 %RPD
		Acenaphthene	0-19 %RPD				Acenaphthene	0-19 %RPD
		4-Nitrophenol	0-50 %RPD				4-Nitrophenol	0-50 %RPD
		2,4-Dinitrotoluene	0-47 %RPD				2,4-Dinitrotoluene	0-47 %RPD
		Pentachloro-phenol	0-47 %RPD				Pentachloro-phenol	0-47 %RPD
		Pyrene	0-36 %RPD				Pyrene	0-36 %RPD
Deuterated Monitoring Compounds	all samples	1,4-Dioxane-d8	40-110 %R	Check calculations and instruments, reanalyze affected samples; up to 4 DMCs may fail to meet recovery limits (Section 11.3.4, Page D48/SVOC of SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	1,4-Dioxane-d8	40-110 %R
		Phenole-d5	10-130 %R				Phenole-d5	10-130 %R
		Bis(2-chloroethyl)ether-d8	10-150 %R				Bis(2-chloroethyl)ether-d8	10-150 %R
		2-Chlorophenol-d4	15-120 %R				2-Chlorophenol-d4	15-120 %R
		4-Methylphenol-d8	10-140 %R				4-Methylphenol-d8	10-140 %R
		4-Chloroaniline-d4	1-146* %R				4-Chloroaniline-d4	1-146* %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28C: Semivolatile - Organics/CLP SOM02.4 (Continued)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Semivolatile Organics [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Deuterated Monitoring Compounds [cont'd]	all samples	Nitrobenzene-d5	10-135 %R	Check calculations and instruments, reanalyze affected samples; up to 4 DMCs may fail to meet recovery limits (Section 11.3.4, Page D48/SVOC of SOM02.4)	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	Nitrobenzene-d5	10-135 %R
		2-Nitrophenol-d4	10-120 %R				2-Nitrophenol-d4	10-120 %R
		2,4-Dichlorophenol-d3	10-140 %R				2,4-Dichlorophenol-d3	10-140 %R
		Dimethylphthalate-d6	10-145 %R				Dimethylphthalate-d6	10-145 %R
		Acenaphthalent-d8	15-120 %R				Acenaphthalent-d8	15-120 %R
		4-Nitrophenol-d4	10-150 %R				4-Nitrophenol-d4	10-150 %R
		Fluorene-d10 (SIM)	20-140%				Fluorene-d10 (SIM)	20-140%
		4,6-Dinitro-2-methylphenol-d2	10-130%				4,6-Dinitro-2-methylphenol-d2	10-130%
		Anthracene-d10	25-150 %R				Anthracene-d10	25-150 %R
		Pyrene-d10	10-130 %R				Pyrene-d10	10-130 %R
		Benzo(a)pyrene-d12	10-140 %R				Benzo(a)pyrene-d12	10-140 %R
		Fluoranthene-d10 (SIM)	30-130 %R				Fluoranthene-d10 (SIM)	30-130 %R
		2-Methylnapthalene-d10	20-140 %R				2-Methylnapthalene-d10	20-140 %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28C: Semivolatile - Organics/CLP SOM02.4 (Concluded)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL/TCLP Semivolatile Organics [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	all samples	50-200% of area, ± 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples	EPA CLP RAS Laboratory GC/MS Technician	Accuracy	50-200% of area, ± 30 sec retention time shift

QAPP Worksheet #28: QC Samples Table
Worksheet # 28D: Pesticide - Organics/CLP SOM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples	gamma-BHC (Lindane)	46-127 %R	Flag outliers	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC (Lindane)	46-127 %R
		Heptachlor	35-130 %R				Heptachlor	35-130 %R
		Aldrin	34-132 %R				Aldrin	34-132 %R
		Dieldrin	31-134 %R				Dieldrin	31-134 %R
		Endrin	42-139 %R				Endrin	42-139 %R
		4,4-DDT	23-134 %R				4,4-DDT	23-134 %R
Matrix Spike Duplicate	1 per ≤ 20 samples	gamma-BHC	0-50 %RPD	Flag outliers	EPA CLP RAS Laboratory GC/ECD Technician	Precision	gamma-BHC	0-50 %RPD
		Heptachlor	0-31 %RPD				Heptachlor	0-31 %RPD
		Aldrin	0-43 %RPD				Aldrin	0-43 %RPD
		Dieldrin	0-38 %RPD				Dieldrin	0-38 %RPD
		Endrin	0-45 %RPD				Endrin	0-45 %RPD
		4,4-DDT	0-50 %RPD				4,4-DDT	0-50 %RPD

QAPP Worksheet #28: QC Samples Table
Worksheet # 28D: Pesticide - Organics/CLP SOM02.4 (Concluded)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL Pesticides [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Laboratory Control Sample	all samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC	50-120 %R
		Heptachlor epoxide	50-150 %R				Heptachlor epoxide	50-150 %R
		Dieldrin	30-130 %R				Dieldrin	30-130 %R
		4,4'-DDE	50-150 %R				4,4'-DDE	50-150 %R
		Endrin	50-120 %R				Endrin	50-120 %R
		Endosulfan sulfate	50-120 %R				Endosulfan sulfate	50-120 %R
		gamma-Chlordane	30-130 %R				gamma-Chlordane	30-130 %R
Surrogate	all samples		30–150 %R	Check calculations and instruments, reanalyze affected samples	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy		30-150 %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28E: PCBs - Organics/CLP SOM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TCL PCBs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples	Aroclor-1016	29-135 %R	EPA CLP RAS Laboratory GC/ECD Technician	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R				Aroclor-1260	29-135 %R
Matrix Spike Duplicate	1 per ≤ 20 samples	Aroclor-1016	0-15 %RPD	EPA CLP RAS Laboratory GCECD Technician	EPA CLP RAS Laboratory GC/ECD Technician	Precision	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD				Aroclor-1260	0-20 %RPD
Laboratory Control Sample	all samples	Aroclor-1016	50-150 %R	EPA CLP RAS Laboratory GC/ECD Technician	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy	Aroclor-1016	50-150 %R
		Aroclor-1260	50-150 %R				Aroclor-1260	50-150 %R
Surrogate	all samples		30-150%R	EPA CLP RAS Laboratory GC/ECD Technician	EPA CLP RAS Laboratory GC/ECD Technician	Accuracy		30-150%R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28F: TAL Metals – Inorganics/CLP ISM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TAL/TCLP Metals
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank	1 per ≤ 20 samples	No constituent > CRQL	Suspend analysis until source rectified; redigest and reanalyze affected samples	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	No constituent > CRQL
Spike	1 per ≤ 20 samples	75-125%R*	Flag outliers	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	75-125%R*
Duplicate	1 per ≤ 20 samples	± 20% RPD**	Flag outliers	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Precision	± 20% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	75-125%R	Flag outliers	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	75-125%R
Interference Check Sample [ICP Analysis Only]	beginning of each run	Within ± (CRQL + true value) or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Sensitivity	Within ± (CRQL + true value) or ± 20% of true value, whichever is greater

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken
**Reference USEPA Region IIa SOP No. HW-2a, Revision 15/Evaluation of Metals Data for CLP - (include absolute difference criteria)
**except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.

QAPP Worksheet #28: QC Samples Table
Worksheet # 28F: TAL Metals – Inorganics/CLP ISM02.4 (Concluded)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	TAL/TCLP Metals [cont'd]
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per $\leq$ 20 samples	70-130%	Suspend analysis until source rectified; redigest and reanalyze affected samples	EPA CLP RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	70-130%*

QAPP Worksheet #28: QC Samples Table
Worksheet # 28G: Total Mercury – Inorganics/CLP ISM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	Target Analyte List Inorganics –Total/TCLP Mercury
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per $\leq$ 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	EPA CLP RAS Laboratory Technician	Accuracy	No analyte > CRQL
Duplicate Sample	1 per $\leq$ 20 samples	$\pm$ 20% RPD	Flag outliers	EPA CLP RAS Laboratory Technician	Precision	$\pm$ 20% RPD
Spike Sample	1 per $\leq$ 20 samples	75 – 125 %R	Flag outliers	EPA CLP RAS Laboratory Technician	Accuracy	75 – 125 %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28H: Total Cyanide – Inorganics/CLP ISM02.4

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil
Analytical Group	Target Analyte List Inorganics – Total Cyanide
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SOM02.4
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	EPA CLP RAS Laboratory
No. of Sample Locations	3

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per $\leq$ 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	EPA CLP RAS Laboratory Technician	Accuracy	No analyte > CRQL
Duplicate Sample	1 per $\leq$ 20 samples	$\pm$ 20% RPD	Flag outliers	EPA CLP RAS Laboratory Technician	Precision	$\pm$ 20% RPD
Spike Sample	1 per $\leq$ 20 samples	75 – 125 %R	Flag outliers	EPA CLP RAS Laboratory Technician	Accuracy	75 – 125 %R

QAPP Worksheet #28: QC Samples Table
Worksheet # 28I: Herbicide – Organics/SW 846 Method 8151A

Matrix	Soil
Analytical Group	TCLP Herbicides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA/ERT 2001, 2012
Analytical Method/SOP Reference	SW 846 Method 8151A/SOP# HW-17, Rev. 2
Sampler's Name	Bernard Nwosu
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	START V procured non-RAS Laboratory
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples OR whenever samples extracted	No analyte > CRQL	Suspend analysis unit source recertified	EPA non-RAS Laboratory GC/ECD Technician	No analyte > CRQL
Matrix Spike	1 per ≤ 20 samples; if requested	70-130 %R	Flag outliers	EPA non-RAS Laboratory GC/ECD Technician	70-130 %R
Matrix Spike Duplicate	1 per ≤ 20 samples; if requested	70-130 %R	Flag outliers	EPA non-RAS Laboratory GC/ECD Technician	70-130 %R
Laboratory Control Sample	1 per ≤ 20 samples	70-130 %R	Check calculations and instruments, reanalyze affected samples	EPA non-RAS Laboratory GC/ECD Technician	70-130 %R
Surrogate	all samples	70-130 %R		EPA non-RAS Laboratory GC/ECD Technician	70-130 %R

Note: Data reviewer will examined and follow In-house QC limit to qualify the data, if in-house limits not developed, then above QC limits will be use.

QAPP Worksheet #29: QC Samples Table
QAPP Worksheet #29: Project Documents and Records

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Field Logbook or Data Collection Sheets	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Chain-of-Custody Forms	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Custody Seals	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Air Bills	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Daily QC Reports	SPM	Group Leader or Operations Manager	Project File
Deviations	SPM/Field Scientist	Group Leader or Operations Manager	Project File
Corrective Action Reports	Delegated QA Manager	Operations Manager or Program Manager or designee	Project File
Correspondence	SPM	Delegated QA Manager	Project File
Field Sample Results/Measurements	SPM/Field Scientist	Delegated QA Manager	Project File
Tailgate Safety Meeting Items	SPM/Field Safety Officer	Delegated QA Manager	Project File

Project Assessments			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Data Verification Checklists	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Validation Report	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Usability Assessment Report	Site Project Manager	Group Leader or Operations Manager	Project File
Corrective Action Reports	Group Leader/HSO/Chemist QA/QC Specialist	Group Leader	Project File
Correspondence	Group Leader/HSO/Chemist QA/QC Specialist	Program Manager or designee	Project File

QAPP Worksheet #29: Project Documents and Records (Concluded)

Laboratory Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Sample Receipt, Custody, and Checklist	Laboratory Sample Receiving	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Calibration Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Standard Traceability Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Prep Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Run Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Maintenance, Testing, and Inspection Logs	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File
Corrective Action Reports	Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File and Project File
Laboratory Analytical Results	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Laboratory QC Samples, Standards, and Checks	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Instrument Results (raw data) for Primary Samples, Standards, QC Checks, and QC Samples	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Disposal Records	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory File

Laboratory Data Deliverables[1]						
Record	**VOCs**	**SVOCs**	**PCBs**	**Pesticides**	**Metals**	**Other[2]**
Narrative	Y	Y	Y	Y	Y	Y
Chain of Custody	Y	Y	Y	Y	Y	Y
Summary Results	Y	Y	Y	Y	Y	Y
QC Results	Y	Y	Y	Y	Y	Y
Chromatograms or raw data	Y	Y	Y	Y	Y	Y
Tentatively Identified Compounds	Y	Y	NA	NA	NA	NA

[1] The blank Laboratory Data Deliverables table is designed to be a checklist for use in supporting data completeness. The records and analytical groups in this table are not all inclusive of those that may be used on a specific project and should be modified and utilized by the delegated SPM as applicable
[2]Full TCLP, RCRA Characteristics, and Radiochemistry

Worksheet 31, 32 & 33 — Assessments and Corrective Action

Assessments:

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
Field Sampling Technical Systems Audit (TSA)[1]	Chemist QA/QC Specialist (or designee) and Group Leader or Operational Manager WESTON	As needed, as determined by WESTON Chemist QA/QC Specialist (or designee) and Group Leader or Program Manager WESTON	To be completed near the beginning of field sample collection activities/TBD	TSA Memorandum and Checklist	48 to 72 hours following assessment
Laboratory TSA[2]	Laboratories QA Managers Regulatory Agency	CLP and certified subcontract laboratories are routinely audited by accrediting authorities.	Every Year	Written Report	14 Days
Data Validation	Chemist QA/QC Specialist or Data Validator WESTON	Each data package for which data validation was requested; varies by site	Within 42 days from sampling date	Data Validation Report	Varies by site
Management Review	Group Leader and/or Operational Manager WESTON	Varies; as determined by WESTON Program Manager	Within 42 days from sampling date	Quality Management Report (memo/e-mail to file)	1-2 weeks following assessment

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

Worksheet 31, 32 & 33 — Assessments and Corrective Action (Concluded)

Assessment Response and Corrective Action:

Assessment Type	Responsibility for Responding to Assessment Findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for Monitoring Corrective Action Implementation
Field Sampling Technical Systems Audit (TSA)[1]	SPM WESTON	Findings of field audit.	24 hours of receipt of audit report	Operational Manager WESTON	SPM or Operational Manager WESTON
Laboratory TSA[2]	Laboratories QA Managers CLP Laboratory Chemtech QA Manager: Mohammad Ahmed CLP Laboratory Chemtex QA Manager: Dr. C. N. Readdy, and non-CLP laboratory TestAmerica QA manager: Mike Franks Chemist QA/QC Specialist (or designee) WESTON	Written response to EPA Region II to address deficiencies	1 week of receipt of request from EPA Region II (or START V on behalf of EPA)	Laboratory Manager	Quality Manager (or designee) and/or Chemist WESTON
Data Validation	Chemist QA/QC Specialist (or designee) WESTON	Validation Report	Within 48 hours of receipt of validation inquiry	Laboratory QA Manager and/or Chemist	Chemist WESTON
Management Review	Program Manager WESTON	Quality Management Response	48 hours of receipt of Quality Management report	Program Manager WESTON	Chemist QA/QC Specialist (or designee) and Program Manager WESTON

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

QAPP Worksheet #34: Data Verification and Validation Inputs

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
3	Field SOPs	X	
4	Laboratory SOPs	X	
5	Laboratory QA Manual	NA	
6	Laboratory Certifications	X	
Field Records			
7	Field Logbooks	X	X
8	Equipment Calibration Records	X	X
9	Chain of Custody Forms	X	X
10	Sampling Diagrams/Surveys	X	X
11	Drilling Logs	NA	NA
12	Geophysics Reports	NA	NA
13	Relevant Correspondence	X	X
14	Change Orders/Deviations	X	X
15	Field Audit Reports	X	X
16	Field Corrective Action Reports	X	X
17	Sample Location Verification (Worksheet 18)	X	X
Analytical Data Package and Other Laboratory Deliverables			
18	Cover Sheet (laboratory identifying information)	X	X
19	Case Narrative	X	X
20	Internal Laboratory Chain of Custody	X	X
21	Sample Receipt Records	X	X
22	Sample Chronology (i.e. dates and times of receipt, preparation, & analysis)	X	X
23	Communication Records	X	X
24	Project-specific PT Sample Results	NA	NA
25	RL/MDL Establishment and Verification	X	X
26	Standards Traceability	NA	NA
27	Instrument Calibration Records	X	X
28	Definition of Laboratory Qualifiers	X	X
29	Results Reporting Forms	X	X
30	QC Sample Results	X	X
31	Corrective Action Reports	X	X
32	Raw Data	X	X
33	Electronic Data Deliverable	X	X

QAPP Worksheet #35: Data Verification Procedures

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
Contract QAPP	Contract, EPA and UFP-QAPP Guidance documents	Verify completeness, correctness, and contractual compliance of all program QA/QC against the methods, SOPs, and contract requirements.	Timothy Benton WESTON Program Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Site-specific QAPP	Contract QAPP, Work Scope in TDD	Verify sampling and analytical methods specified in site-specific QAPP are correct and all contract QAPP protocols are followed and required QC samples will be collected in the correct bottles and properly preserved.	Bernard Nwosu WESTON Operational Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logs and SOPs	Contract and site-specific QAPP, SOPs	Ensure that all field sampling SOPs specified in site-specific QAPP were followed.	WESTON SPM and Data Validation Personnel
Analytical SOPs	Analytical Method and Contract QAPP	Ensure that laboratory analytical SOPs comply with the published method.	Mohammad Ahmed/Chemtech, Dr. C. N. Reddy/Chemtex, Mike Franks/TestAmerica, CLP/non-CLP Laboratories QA Managers. Smita Sumbaly, WESTON Chemist QA/QC Specialist /Data validation Personnel
Laboratory QA Manual	EPA Guidance Documents	Verify that best practices specified in EPA Guidance Documents are incorporated into the Laboratory QA Manual.	Mohammad Ahmed/Chemtec, Dr. C. N. Reddy/Chemtex, Mike Franks/TestAmerica, CLP/no-CLP Laboratories QA Managers
Laboratory Certifications	Generic and site-specific QAPP	Ensure that laboratory performing analytical sample analyses has current State, National Environmental Laboratory Accreditation Program, National Voluntary Laboratory Accreditation Program, or American Industrial Hygiene Association certifications as required by the project.	Mohammad Ahmed/Chemtec, Dr. C. N. Reddy /Chemtex, Mike Franks/TestAmerica, CLP/no-CLP Laboratories QA Managers Smita Sumbaly, WESTON Chemist QA/QC Specialist
Laboratory Deliverables	Contract and site-specific QAPP	Verify that the laboratory deliverable contains all records specified in the contract QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported. Compare the data package with Chains of custody to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. If Stage 2B or higher validation is required, verify that analytical instrumentation met calibration requirements. Check for evidence that any required notifications were provided to project personnel. Verify that necessary signatures and dates are present.	CLP Data: EPA ESAT Data Reviewers Non-CLP Data: Data Validators, WESTON, Smita Sumbaly, Chemist QA/QC Specialist

* Site-specific QAPP may contain additional data validation inputs as required by the project objectives.

QAPP Worksheet #35: Data Verification Procedures (Concluded)

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
WESTON Data Validation Deliverables	Laboratory Report, Analytical Method and Laboratory SOPs	Verify that the report consists of the following for all field samples submitted to the laboratory: 1) Data validation report (pdf), 2) Sample Summary Report with data validation qualifiers, and 3) Excel EDD file with data validation qualifiers	WESTON Data Validator Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logbook, Field Sheets, Sample Diagrams/ Surveys	Contract and site-specific QAPP	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	WESTON SPM and Operational Manager
Field Equipment Calibration Records	Contract and site-specific QAPP, SOPs, field logbook	Ensure that all field analytical instrumentation SOPs for equipment calibration were followed.	WESTON SPM and Operational Manager
Chain of Custody Forms	Site-specific QAPP; Field Logbook; and other sampling records (e.g., boring logs, etc.)	Verify the completeness of Chain-of-Custody records. Examine entries for consistency with the field logbook. Check that appropriate methods were requested and sample preservation was recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for Laboratory QC samples (e.g., MS/MSD and S/D). Verify that all required signatures and dates are present. Check for transcription errors.	WESTON SPM, WESTON Chemist QA/QC Specialist, and Laboratory PM
Relevant reports and correspondence	Contract and site-specific QAPP	Verify that reports are present and complete for each day of field activities. Verify that correspondence is documented and was reported in accordance with requirements.	WESTON Operational Manager and SPM
Audit Reports, Corrective Action Reports	Generic and site-specific QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Smita Sumbaly, WESTON Chemist QA/QC Specialist Laboratory PM, TBD

Worksheet 36 — Data Validation Procedures

The following information is project-specific and will be identified in the site-specific or QAPP.

Data Validator: WESTON

Analytical Group/ Method	Data Deliverable Requirements	Analytical Specifications	MPC	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code	Electronic Validation Program/Version
TCL/TCLP VOC-SOM02.4	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP# HW-24	TBD	Excel EDD
TCL/TCLP SVOC-SOM02.4	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP# HW-22	TBD	Excel EDD
TCL/TCLP Pesticides-SOM02.4	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP# HW-44	TBD	Excel EDD
PCBs-SOM02.4	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP# HW-45	TBD	Excel EDD
TAL Metals + Hg + CN/ TCLP Metals + Hg – ISM02.4	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	HW-3a & 3c	TBD	Excel EDD
Radiochemistry – EPA 901.1/HASL-300-A-01-R, SW-846/6020A	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	As per lab SOPs and Analytical Methods	TBD	Excel EDD
TCLP Herbicides	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	HW-17	TBD	Excel EDD

Note: Samples for Full TCLP, and RCRA Characteristics will be collected only for screening purposes. MS/MSD and Field duplicate samples will not be collected. Data will be reviewed for methods, procedures, and contract are with compliance.

QAPP Worksheet #37: Usability Assessment

Data usability assessments (DUA) will be performed as directed by EPA. This worksheet documents procedures that will be used to perform the DUA. The DUA is performed at the conclusion of data collection activities using the outputs from data verification and data validation (i.e., data of known and documented quality). It is the data interpretation phase, which involves a qualitative and quantitative evaluation of environmental data to determine whether the Site data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective evaluation of the systematic planning process, and involves participation by key members of the project team. The DUA evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

Data, whether generated in the field or by the laboratory, are tabulated and reviewed for PARCCS by the SPM for field data or the data validator for laboratory data. The review of the PARCC Data Quality Indicators (DQI) will compare with the Data Quality Objectives (DQO) detailed in the site-specific QAPP, the analytical methods used and impact of any qualitative and quantitative trends will be examined to determine if bias exists. A hard copy of field data is maintained in a designated field or site logbook. Laboratory data packages are validated, and final data reports are generated. All documents and logbooks are assigned unique and specific control numbers to allow tracking and management.

Where applicable, the following documents will be followed to evaluate data for fitness in decision making: EPA QA/G-4, Guidance on Systematic Planning using the Data Quality Objectives Process, EPA/240/B-06/001, February 2006, and EPA QA/G-9R, Guidance for Data Quality Assessment, A reviewer's Guide EPA/240/B-06/002, February 2006.

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

- START V Operations Manager;
- START V Quality Manager (or designee);
- START V Risk Assessor;
- START V SPM;
- START V Chemist QA/QC Specialist;
- START V Statistician.

Based on project-specific oversight responsibilities and analytical scopes, this DUA worksheet outlines the approach that will be taken as the analytical scope expands on a project-specific basis.

The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

QAPP Worksheet #37: Usability Assessment (Concluded)

Step 1 – Review the project's objectives and sampling design: This includes reviewing the DQOs and MPC to make sure they are still applicable. The sampling design will be consistent with stated DQOs.

Step 2 – Review the data verification and data validation outputs: Graphs, maps, and tables can be prepared to summarize the data. Deviations from activities planned in the Project QAPP should be considered, including samples not collected (potential data gaps), holding time exceedances, damaged samples, impact of non-compliant PE sample results, and SOP deviations. The implications of unacceptable QC sample results will be assessed.

Step 3 – Verify the assumptions of the selected statistical method: The underlying assumptions for the selected statistical methods (if specified in the QAPP) will be verified for validity. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may be selected.

Step 4 - Implement the statistical method: If specified in the site-specific QAPP, statistical procedures will be implemented for analyzing the data and reviewing underlying assumptions. For a decision project that involves hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") the consequences of selecting the incorrect alternative will be considered; for estimation projects (e.g., establishing a boundary for surface soil contamination), the tolerance for uncertainty in measurements will be considered.

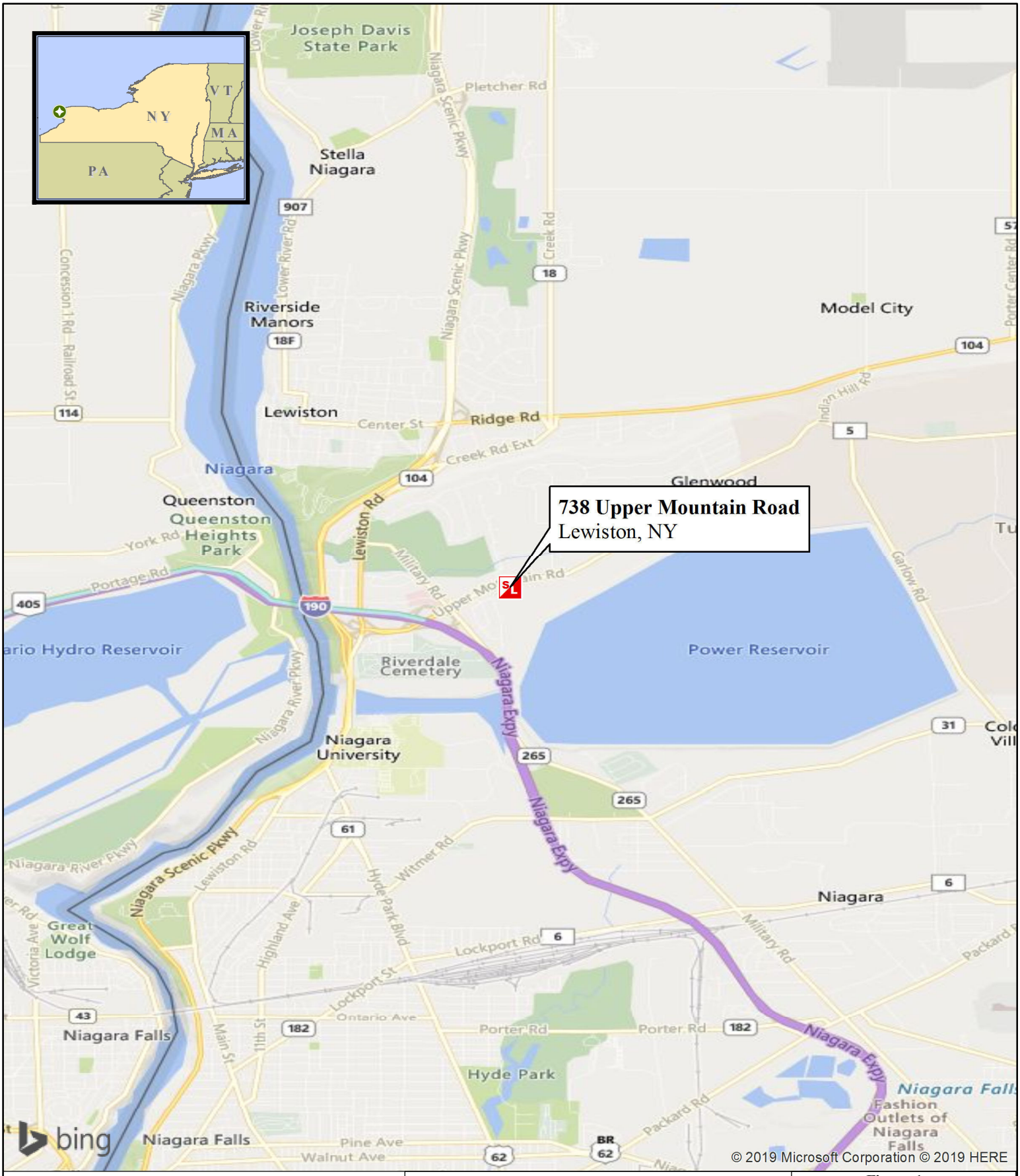
Step 5 – Document data usability and draw conclusions:

The DUA considered the final step in the data evaluation process. All data will be assessed for usability regardless of data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and site-specific QAPP with the obtained results. The results of the DUA, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be communicated in accordance with Worksheet 6.

The usability of the data as intended will be determined. Achievable DQOs, based on comparison with the Site DQIs, will be discussed. The performance of the sampling design will be assessed and limitations of the data use identified. The conceptual site model will be updated and conclusions documented. A DUA report (in the form of text/or table) will be prepared or a data usability summary will be included in the final report.

ATTACHMENT A

Figure 1: Site Location Map



Legend

Site Location

N

0 0.325 0.65 1.3 1.95 2.6 Miles

Weston Solutions, Inc.
Federal East Division

In Association With
Eco-Risk; Avatar Environmental, LLC;
Pro-West & Associates, Inc.;
On-Site Environmental, Inc.;
and Sovereign Consulting, Inc.

Figure 1:
Site Location Map

738 Upper Mountain Road Site
Lewiston, New York

U.S. ENVIRONMENTAL PROTECTION AGENCY
SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V
CONTRACT # 68HE0319D0004

GIS ANALYST:	M. LANG
EPA OSC:	E. DALY
START V SPM:	B. NWOSU
CHARGE #::	40200.011.032.1040

DATE MODIFIED: 10/16/2019

\\FSED2DATA1\GISDATA\START_V\00320040\MXD\191016_UMR_SLM.MXD

ATTACHMENT B

Sampling SOPs

EPA ERT/SERAS SOP # 2001
EPA ERT/SERAS SOP # 2012
NYSDEC DER-10 (Reference Pages Only)

GENERAL FIELD SAMPLING GUIDELINES

CONTENTS

Complete Rewrite: SOP #2001; Revision 1.0; 03/15/13; U.S. EPA Contract EP-W-09-031

SUPERCEDES: SOP #2001; Revision 0.0; 08/11/94; U.S. EPA Contract 68-C4-0022

GENERAL FIELD SAMPLING GUIDELINES

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to describe the general field sampling techniques and guidelines that will assist the Scientific Engineering Response and Analytical Services (SERAS) personnel in planning, choosing sampling strategies and sampling locations, and frequency of Quality Control (QC) samples for proper assessment of site characteristics. The ultimate goal is to ensure data quality during field collection activities.

2.0 APPLICABILITY

This SOP applies to the collection of aqueous and non-aqueous samples for subsequent laboratory analysis to determine the presence, type, and extent of contamination at a site.

3.0 DESCRIPTION

Representative sampling ensures that a sample or a group of samples accurately reflect the concentration of the contaminant at a given time and location. Depending on the contaminant of concern and matrix, several variables may affect the representativeness of the samples and subsequent measurements. Environmental variability due to non-uniform distribution of the pollutant due to topographic, meteorological and hydrogeological factors, changes in species, and dispersion of contaminants and flow rates contribute to uncertainties in sampling design.

Determining the sampling approach depends on what is known about the site from prior sampling (if any) and the site history, variation of the contaminant concentrations throughout a site, potential migration pathways, and human and environmental receptors. The objectives of an investigation determine the appropriate sampling design.

The frequency of sampling and the specific sample locations that are required must be defined in the site-specific Quality Assurance Project Plan (QAPP).

3.1 Planning Stage

The objectives of an investigation are established and documented in the site-specific QAPP. The technical approach including the media/matrix to be sampled, sampling equipment to be used, sampling design and rationale, and SOPs or descriptions of the procedure to be implemented are included in the QAPP. Refer to the matrix-specific SOPs for sampling techniques which include the equipment required for sampling.

During the planning stage, the data quality objectives (DQOs) will be determined. In turn, the project's DQOs will determine the need for screening data or definitive data. Screening data supports an intermediate or preliminary decision but eventually is supported by definitive data before the project is complete (i.e., placement of monitor wells, estimation of extent of contamination). Definitive data is suitable for final decision making, has defined precision and accuracy requirements and is legally defensible (i.e., risk assessments, site closures).

3.2. Sampling Design

Representative sampling approaches include judgmental, random, systematic grid, systematic simple random, stratified random and transect sampling. Sampling designs may be applied to soil,

sediment and water; however, the random and systematic random approaches are not practical for sampling water systems, especially flowing water systems.

3.2.1 Judgmental Sampling

Judgmental sampling is the subjective selection of sampling locations based on the professional judgment of the field team. This method is useful to locate and to identify potential sources of contamination. It may not be representative of the full site and is used to document worst case scenarios. For example, groundwater sampling points are typically chosen based on professional judgment, whether permanently installed wells or temporary well points.

3.2.2 Systematic Sampling

Systematic grid sampling involves the collection of samples at fixed intervals when the contamination is assumed to be randomly distributed. A random point is chosen as the origin for the placement of the grid. A grid is constructed over a site and samples are collected from the nodes (where the grid lines intersect). Depending on the number of samples that are required to be collected, the distance between the sampling locations can be adjusted. The representativeness of the sampling may be improved by shortening the distance between sample locations.

Systematic random sampling is used for estimating contaminant concentrations within grid cells. Instead of sampling at each node, a random location is chosen within each grid cell. The systematic grid and random sampling approaches are useful for delineating the extent of contamination, documenting the attainment of clean-up goals, and evaluating and determining treatment and disposal options.

Transect sampling involves one or more transect lines established across the site. Samples are collected at systematic intervals along the transect lines. The number of samples to be collected and the length of the transect line determines the spacing between the sampling points. This type of sampling design is useful for delineating the extent of contamination at a particular site, for documenting the attainment of clean-up goals, and for evaluating and determining treatment and disposal options.

3.2.3 Simple and Stratified Random Sampling

Statistical random sampling includes simple, stratified and systematic sampling. Simple random sampling is appropriate for estimating means and total concentrations, if the site or population does not contain a major trend or pattern of contamination. A statistician will generate the sampling locations based on sound statistical methods. Stratified random sampling is a useful tool for estimating average contaminant concentrations and total amounts of contaminants within specified strata and across the entire site. It is useful when a heterogeneous population or area can be broken down into regions with less variability within the boundaries of a stratum then between the strata. Additionally, strata can be defined based on the decisions that will be made. This type of sampling design uses historical information, known ecological and human receptors, soil type, fate and transport mechanism and other ecological factors to divide the sampling area into smaller regions or strata. Sampling locations are selected from each stratum using random sampling.

The simple random sampling approach is applied when there are many sample locations and the concentrations are assumed to be homogeneous across a site with respect to the parameter(s) that are going to be analyzed or monitored for. The stratified random sampling approach is useful for sampling drums, evaluating and determining treatment and disposal options, and locating and identifying sources of contamination.

3.3 Sampling Techniques

Sampling is the selection of a representative portion of a larger population or body. The primary objective of all sampling activities is to characterize a site accurately in a way that the impact on human health and the environment can be evaluated appropriately.

3.3.1 Sample Collection Techniques

Sample collection techniques may be either grab or composite. A grab sample is a discrete aliquot representative of a specific location at a given time and collected all at once from one location. The representativeness of such samples is defined by the nature of the materials that are sampled. Samples collected for volatile organic compounds (VOCs) are always grab samples and are never homogenized. Composite samples are non-discrete samples composed of more than one specific aliquot collected at selected sampling locations. Composite samples must be homogenized by mixing prior to putting the sample into containers. Composite samples can, in certain instances, be used as an alternative to analyzing a number of individual grab samples and calculating an average value. Incremental sampling conducted over a grid is a special case of composite sampling and is detailed in SOP #2019, *Incremental Soil Sampling*. Choice of collecting discrete or composite samples is based on project's DQOs.

3.3.2 Homogenization

Mixing of soil and sediment samples is critical to obtain a representative sample. An adequate volume/weight of sample is collected and placed in a stainless steel or Teflon® container, and is thoroughly mixed using a spatula or spoon made of an inert material. Once the sample is thoroughly mixed the sample is placed into sample containers specific for an analysis. Avoid the use of equipment made of plastic or polyvinyl chloride (PVC) when sampling for organic compounds when the reporting limit (RL) is in the parts per billion (ppb) or parts per trillion (ppt) ranges. Refer to SERAS SOP #2012, *Soil Sampling*, for more details on homogenization.

3.3.3 Filtration

In-line filters are used specifically for collecting groundwater samples for dissolved metals analysis and for filtering large volumes of turbid groundwater. Groundwater samples collected for VOCs are typically not filtered due to potential VOC losses. Filtering groundwater is performed to remove silt particulates from samples to prevent interference with the laboratory analysis. The filters used in groundwater sampling are either cartridge type filters inserted into a reusable housing, or are self-contained and disposable. Filter chambers are usually made of polypropylene housing an inert filtering material that removes particles larger than 0.45 micrometers (µm). Refer to SERAS SOP

#2007, *Groundwater Well Sampling* and SERAS SOP #2013, *Surface Water Sampling*, for more details on filtration techniques.

3.4 Quality Assurance /Quality Control Samples

QA/QC samples provide an evaluation of both the laboratory's and the field sampling team's performance. Including QA/QC samples in a sampling design allows for identifying and measuring sources of error potentially introduced from the time of sample container preparation through analysis. The most common QA/QC samples collected in the field are collocated field duplicates, field replicates, equipment blanks, field blanks and trip blanks. Extra volume/mass is collected for a matrix spike/matrix spike duplicate (MS/MSD) at a frequency of 5% (one in 20 samples). Spiking is performed in the laboratory. For additional information or other QA/QC samples pertinent to sample analysis, refer to SERAS SOP #2005, *Quality Assurance/Quality Control Samples*.

Collocated field duplicates may be collected based on site objectives and used to measure variability associated with the sampling process including sample heterogeneity, sampling methodology, and analytical procedures. Field replicates are field samples obtained from one location, homogenized, and divided into separate containers. This is useful for determining whether the sample has been homogenized properly. Equipment blanks (also known as rinsate blanks) are typically collected at a rate of one per day. The equipment blank is used to evaluate the relative cleanliness of non-dedicated equipment.

3.5 Sample Containers, Preservation, Storage and Holding Times

The amount of sample to be collected, the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix sampled and the analyses to be conducted. This information is provided in SERAS SOP #2003, *Sample Storage, Preservation, and Handling*. Field personnel need to be cognizant of any short holding times that warrant immediate shipment/transfer to the laboratory.

3.6 Documentation

Field conditions and site activities must be documented. Scribe will be used to document sample locations and generate chain of custody records. Other field measurements not typically entered into Scribe will be documented in a site-specific logbook or in a personal logbook. All sample documentation will be maintained in accordance with SERAS SOP #2002, *Sample Documentation* and SERAS SOP #4005, *Chain of Custody Procedures.*

4.0 RESPONSIBILITIES

4.1 SERAS Task Leaders

Task Leaders (TLs) are responsible for the overall management of the project. Task Leader responsibilities include ensuring that field personnel are well informed of the sampling requirements for a specific project and that SOP and QA/QC procedures stated in the site-specific QAPP are adhered to, issuing a Field Change Form that documents any changes to sampling activities after the QAPP has been approved and maintaining sample documentation.

4.2 SERAS Field Personnel

Field personnel are responsible for reading the QAPP prior to site activities and performing sample collection activities as written. They are responsible for notifying the TL of deviations from sample collection protocols which occurred during the execution of sampling activities. Field staff will collect samples and prepare documentation in accordance with SERAS SOP #2002, *Sample Documentation*. In addition, field personnel are responsible for reading and conforming to the approved site-specific Health and Safety Plan (HASP).

4.3 SERAS Program Manager

The SERAS Program Manager is responsible for the overall technical and financial management of the project.

4.4 SERAS QA/QC Officer

The QA/QC Officer is responsible for reviewing this SOP and ensuring that the information in this SOP is updated on a timely basis. Compliance to this SOP may be monitored by either conducting a field audit or reviewing deliverables prepared by the SERAS TL.

4.5 Health and Safety (H&S) Officer

The H&S Officer is responsible for ensuring that a HASP has been written in conformance with SOP # 3012, *SERAS Health and Safety Guidelines for Field Activities* and approved prior to field activities. Additionally, the H& S Officer is responsible for ensuring that SERAS site personnel's H&S training is current as per SOP # 3006, *SERAS Field Certification Program* and that their medical monitoring is current as per *SERAS SOP #3004, SERAS Medical Monitoring Program.*

SOIL SAMPLING

CONTENTS

*These sections affected by Revision 1.0.

SUPERCEDES: SOP #2012; Revision 0.0; 2/18/00; U.S. EPA Contract 68-C99-223.

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative surface soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push technology, or other mechanized equipment (except for a back-hoe). Sample depths typically extend up to 1-foot below ground surface. Analysis of soil samples may define the extent of contamination, determine whether concentrations of specific contaminants exceed established action levels, or if the concentrations of contaminants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with a final report.

Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Surface soil samples can be used to investigate contaminants that are persistent in the near surface environment. Contaminants that are detected in the near surface environment may extend to considerable depths, may migrate to the groundwater, surface water, the atmosphere, or may enter biological systems.

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (discrete or composite), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and/or scoop. Sampling at greater depths may be performed using a hand auger, continuous-flight auger, trier, split-spoon sampler, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples must be cooled and maintained at 4^{o}C and protected from sunlight immediately upon collection to minimize any potential reaction. The amount of sample to be collected, proper sample container type and handling requirements are discussed in the Scientific, Engineering, Response Analytical Services (SERAS) SOP #2003, *Sample Storage, Preservation and Handling.*

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary problems associated with soil sampling: 1) cross contamination of samples, and 2) improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, decontamination of sampling equipment is necessary. The guidelines for preventing, minimizing and limiting cross contamination of samples are discussed in the Environmental Response Team (ERT)/SERAS SOP #2006, *Sampling Equipment Decontamination*. Improper sample collection procedures can disturb the sample matrix, resulting in volatilization of contaminants, compaction of the sample, or inadequate homogenization of the samples (when required), resulting in variable, non-representative results.

5.0 EQUIPMENT/APPARATUS

Soil sampling equipment includes the following:

- Site maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan (HASP)
- Traditional survey equipment or global positioning system (GPS)
- Tape measure
- Survey stakes or flags
- Camera and image collection media
- Stainless steel, plastic*, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Site logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Plastic sheeting
- Spade or shovel
- Spatula(s)
- Scoop(s)
- Plastic* or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoon sampler
- Soil core sampler
  - Tubes, points, drive head, drop hammer, puller jack and grip
- Photoionization detector (PID), Flame ionization detector (FID) and/or Respirable Aerosol Monitor (RAM)

- Backhoe (as required)
- En Core® samplers

* Not used when sampling for semivolatile compounds.

6.0 REAGENTS

Decontamination solutions are specified in ERT/SERAS SOP #2006, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the analytes to be determined, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.

2. Obtain the necessary sampling and air monitoring equipment.

3. Prepare schedules and coordinate with staff, client, and regulatory agencies, as appropriate.

4. Perform a general site reconnaissance survey prior to site entry in accordance with the site specific HASP.

5. Use stakes or flags to identify and mark all sampling locations. Specific site factors, including extent and nature of contamination, should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared prior to soil sampling; utility clearances must be confirmed before beginning intrusive work.

6. Pre-clean and decontaminate equipment in accordance with the site specific work plan, and ensure that it is in working order.

7.2 Sample Collection

7.2.1 Surface Soil Samples

The collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. The over-burden or over-lying surface material is removed to the required depth and a stainless steel or plastic scoop is used to collect the sample. Plastic utensils are not to be used when sampling for semivolatile compounds.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected by this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials must not be used.

The following procedure is used to collect surface soil samples:

1. If volatile organic compound (VOC) contamination is suspected, use a PID to monitor the sampler's breathing zone during soil sampling activities.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard sticks, rocks, vegetation and other debris from the sampling area.

3. Accumulate an adequate volume of soil, based on the type(s) of analyses to be performed, in

a stainless, plastic or other appropriate container.

4. If volatile organic analysis is to be performed, immediately transfer the sample directly into an appropriate, labeled sample container with a stainless steel spoon, or equivalent, and secure the cap tightly to ensure that the volatile fraction is not compromised. Thoroughly mix the remainder of the soil to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly, or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, head, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger head. If additional sample volume is required, multiple grabs at the same depth are made. If a core sample is to be collected, the auger head is then replaced with a tube auger. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected.

Several types of augers are available; these include bucket or tube type, and continuous flight (screw) or post-hole augers. Bucket or tube type augers are better for direct sample recovery because a large volume of sample can be collected from a discrete area in a short period of time. When continuous flight or post-hole augers are used, the sample can be collected directly from the flights or from the borehole cuttings. The continuous flight or post-hole augers are satisfactory when a composite of the complete soil column is desired, but have limited utility for sample collection as they cannot be used to sample a discrete depth.

The following procedure is used for collecting soil samples with an auger:

1. Attach the auger head to an extension rod and attach the "T" handle.

2. Clear the area to be sampled of surface debris (e.g., twigs, rocks, litter). It may be advisable to remove a thin layer of surface soil for an area approximately six inches in radius around the sampling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents the accidental brushing of loose material back down the borehole when removing the auger or adding extension rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger head, proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a tube sampler. Install the

proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler and unscrew the extension rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the core or a discrete portion of the core into the appropriate labeled sample container using a clean, decontaminated stainless steel spoon. If required, homogenize the sample as described in Step 10.

10. If VOC analysis is to be performed, transfer the sample directly from the auger head into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger head to the drill assembly, and follow steps 3 through 11, making sure to decontaminate the auger head and tube sampler between samples.

12. Abandon the hole according to applicable state regulations.

7.2.3 Sampling at Depth with a Trier

The system consists of a trier and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a zero degree to forty-five degree (0^o to 45^o) angle from the soil surface plane. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If VOC analyses are required, transfer the sample directly from the trier into an appropriate, labeled sample container with a stainless steel spoon, or equivalent device and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; if composite samples are to be collected, place a sample from another sampling interval into the

homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18- or 24- inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with American Society for Testing and Materials (ASTM) D1586-99, "*Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".*

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of the barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler at a 90 degree (90^{o}) angle to the sample material.

3. Using a well ring, drive the sampler. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain the sample.

5. Withdraw the sampler, and open it by unscrewing the bit and head, and then splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2- and 3.5-inch diameter tubes. A larger barrel (diameter and/or length) may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to the appropriately labeled sample container(s) and seal tightly. Place the remainder of the sample into a stainless steel, plastic, or appropriate homogenization container, and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into the appropriate, labeled containers and secure the caps tightly, or if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the hole according to applicable state regulations.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil when a detailed examination of stratigraphy and soil characteristics is required. The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is imperative to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific HASP and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by Occupational Safety and Health Administration (OSHA) regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If VOC analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations.

7.2.6 Sampling for VOCs in Soil Using an En Core® Sampler

An En Core® sampler is a single-use device designed to collect and transport samples to the laboratory. The En Core® sampler is made of an inert composite polymer and reduces the open-air handling of soil samples in the field and in the laboratory; thereby, minimizing losses of VOCs.

1. Assemble the coring body, plunger rod and T-handle according to the instructions provided with the En Core® sampler.

2. Turn the T-handle with the T-up and the coring body down and push the sampler into the soil until the coring body is completely full. Remove the sampler from the soil. Wipe excess soil from the coring body exterior.

3. Cap the coring body while it is still on the T-handle. Push the cap over the flat area of the ridge. Be sure that the cap is seated properly to seal the sampler. Push and cap to lock arm in place.

4. Remove the capped sampler by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.

5. Attach the label to the coring body cap, place in a plastic zippered bag, seal and put on ice.

Generally, three En Core® samplers are required for each sample location. These samplers are shipped to the laboratory where the cap is removed and the soil samples are preserved with methanol or sodium bisulfate.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities that apply to the implementation of these procedures. However, the following general QA procedures apply:

2. All data must be documented in site logbooks or on field data sheets. At a minimum, the following data is recorded:

Sampler's name and affiliation with project
Sample number
Sample location
Sample depth
Approximate volume of sample collected
Type of analyses to be performed
Sample description
Date and time of sample collection
Weather conditions at time of sampling
Method of sample collection
Sketch of sample location

2. All instrumentation must be operated in accordance with applicable SOPs and/or the manufacturer's operating instructions, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.

3. The types of quality control (QC) samples to be collected in the field shall be documented in the site-specific Work Plan.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures, in addition to the procedures specified in the site specific HASP.

12.0 REFERENCES

Mason, B.J. 1983. *Preparation of Soil Sampling Protocol: Technique and Strategies*. EPA-600/4-83-020.

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U.S. Environmental Protection Agency. 1984. *Characterization of Hazardous Waste Sites - A Methods Manual: Volume II.* Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, ER, B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. *Samplers and Sampling Procedures for Hazardous Waste Streams*. EPA-600/2-80-018.

American Society for Testing and Materials. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*. Method D 1586-99.

En Novative Technologies, Inc. 2001. *En Core® Sampler Sampling Procedures*. Web site access. March 13, 2001.

APPENDIX A
Figures
SOP #2012
July 2001

FIGURE 1. Sampling Augers

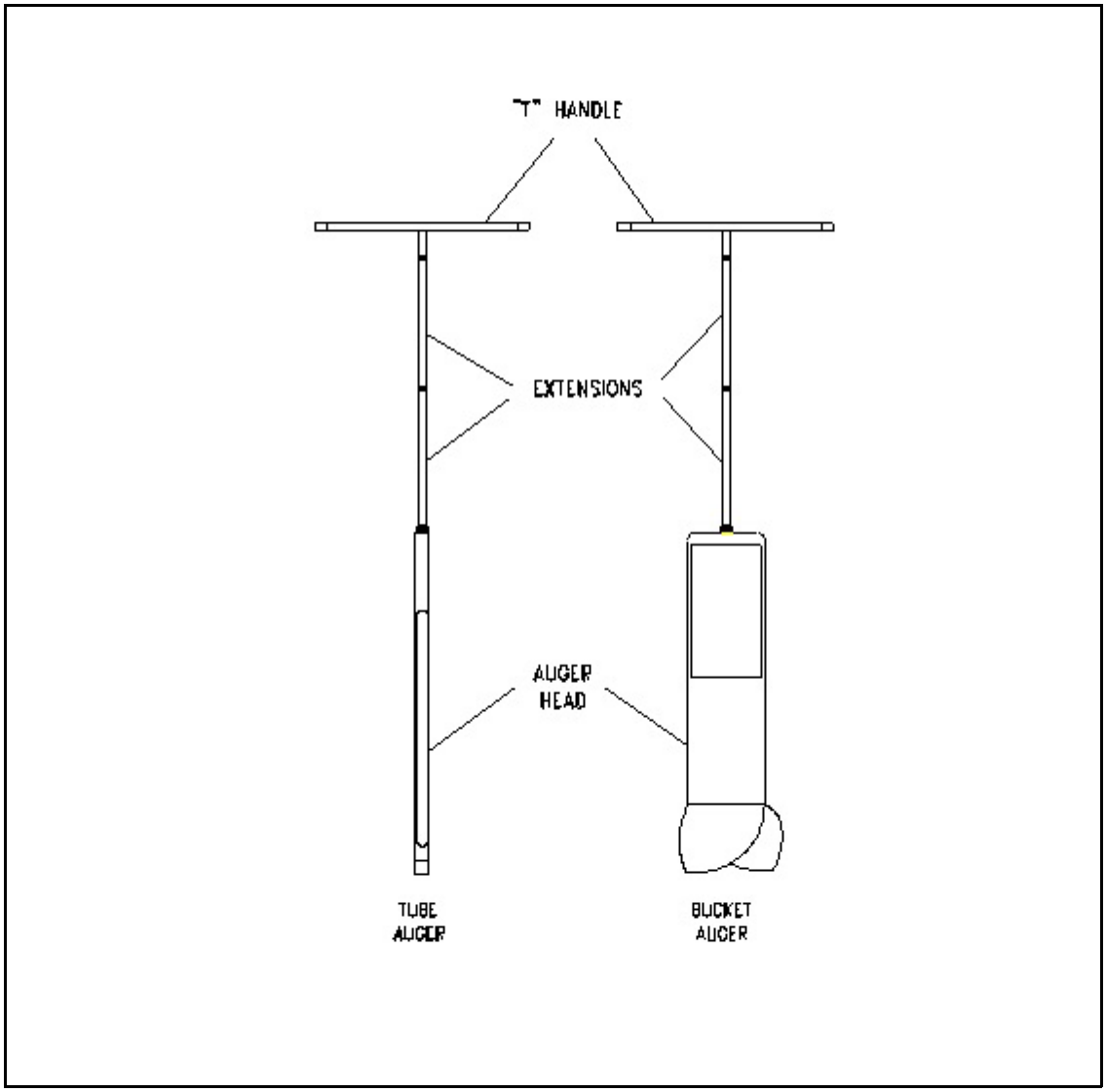
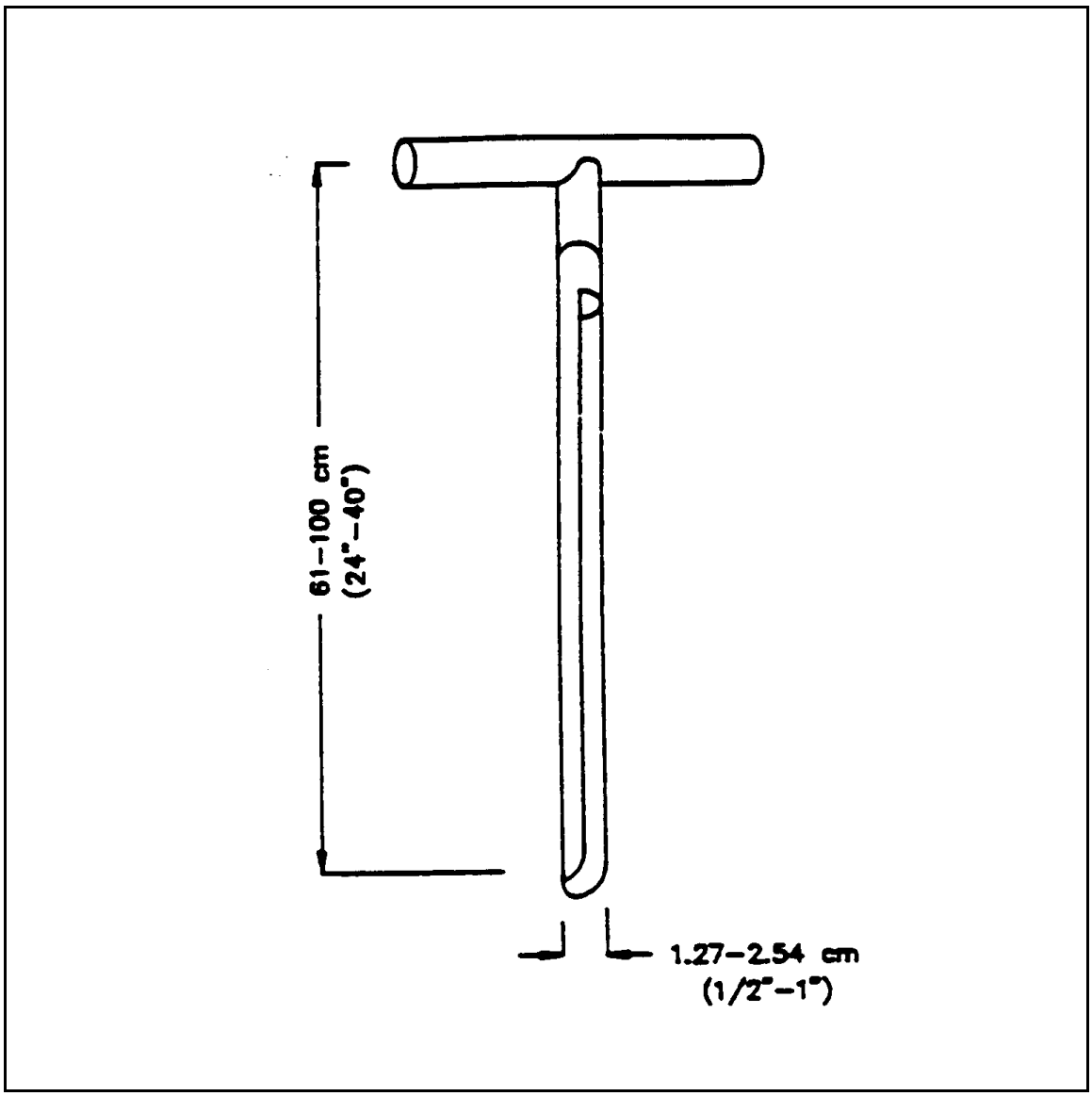


FIGURE 2. Sampling Trier


61-100 cm
(24"-40")
1.27-2.54 cm
(1/2"-1")

site-specific exemption for one or more of the requirements set forth in this section, based upon site-specific conditions, such as:

i. use and redevelopment of the site;

ii. depth of the placement of the backfill material relative to the surface or subsurface structures;

iii. depth of the placement of the backfill material relative to groundwater;

iv. volume of backfill material;

v. potential for odor from the backfill material;

vi. presence of historic fill in the vicinity of the site;

vii. DEC-issued beneficial use determination, pursuant to 6 NYCRR Part 360; or

viii. background levels of contamination in areas surrounding the site.

9. For remedial programs pursuant to the BCP, DEC can only provide a site-specific exemption for backfill consistent with the provisions of paragraph 8 above as follows:

i. for Track 2 and Track 3 cleanups, for soils greater than 15 feet below ground surface; or

ii. for Track 4 cleanups, for soils beneath buildings, pavement and other improvements or for soils beneath the soil cover system or soil cap over exposed surface soils.

10. Sampling fill imported to or exported from a site. The remedial party will sample and analyze the fill being imported to the site in accordance with this subdivision and Table 5.4(e)10. Samples of the fill will be collected based on the soil quantity and type of constituents identified in the table and will be a combination of discrete and composite samples, handled as follows:

i. for VOCs only, grab samples are allowed. These grab samples are one or more discrete samples taken from the fill, with the number as specified in the volatile column of Table 5.4(e)10 for the soil quantity in question, and analyzed for the VOCs identified in Appendix 5; or

ii. for SVOCs, inorganics and PCBs/pesticides:

(1) one or more composite samples are collected from the volume of soil identified in Table 5.4(e)10 for analysis, with each composite from a different location in the fill volume;

(2) each composite is prepared by collecting discrete samples from 3 to 5 random locations from the volume of soil to be tested; and

(3) the discrete samples are mixed, and after mixing, a sample of the mixture is analyzed for the SVOCs, inorganic and PCBs/pesticide constituents identified in Appendix 5.

Table 5.4(e)10 Recommended Number of Soil Samples for Soil Imported To or Exported From a Site			
Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

(f) Compliance for soil exported from a site for reuse. For soil that is being exported from a site to locations other than permitted disposal facilities, the handling requirements are set forth in this subdivision and in paragraph 5.4(e)4.

1. Levels of contamination must not exceed the lower of the groundwater and residential use levels as shown in Appendix 5, absent a beneficial use determination issued by DEC. DER will coordinate with the Division of Solid & Hazardous Materials (DSHM), prior to the start of the remedial action, relative to whether the exported soil can be used beneficially in accordance with 6 NYCRR 360-1. The sampling and analysis requirements are set forth in paragraph 5.4(e)10.

2. The number of required samples are specified in Table 5.4(e)10 and paragraph (e)10 above, which may be modified by the DER project manager based on various factors, including the location of the site receiving the soil.

(g) Compliance for the decommissioning of monitoring wells. All monitoring wells not required for site management should be decommissioned in accordance with paragraph (d)6 above prior to DER approval of the FER.

5.5 Underground Storage Tank Closure

(a) The first step for underground storage tank (UST) closure is the identification, removal, treatment, containment and/or stabilization of the contents to prevent contaminant exposure to receptors and to prevent further movement of contaminants through any pathway as set forth herein.

1. A health and safety plan for the site is developed, as described in section 1.9, by a qualified individual in accordance with subparagraph 1.5(a)3.i.

2. Underground tank closures not performed in accordance with this section will require a certification of the closure report by a professional engineer, as described in section 1.5.

ATTACHMENT C

Action Levels

EPA RMLs for Residential Soil
NYSDEC Unrestricted Use Soil Cleanup Objectives (Reference Pages Only)
EPA MCC for the Toxicity Characteristic (Reference Pages Only)
EPA Site-Specific Preliminary Remediation Goals

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				1.2E-03	O						1.4E+09		1	0.1	Acephate	30560-19-1					9.4E+01	4.0E+02		7.6E+01
		2.2E-06	I			9.0E-03	I	V		1.1E+05	1.4E+09	8.7E+03	1		Acetaldehyde	75-07-0			1.1E+03	1.1E+03			8.2E+01	8.2E+01
				2.0E-02	I						1.4E+09		1	0.1	Acetochlor	34256-82-1					1.6E+03	6.6E+03		1.3E+03
				9.0E-01	I	3.1E+01	A	V		1.1E+05	1.4E+09	1.4E+04	1		Acetone	67-64-1					7.0E+04		4.4E+05	6.1E+04
						2.0E-03	X				1.4E+09		1	0.1	Acetone Cyanohydrin	75-86-5							2.8E+06	2.8E+06
						6.0E-02	I	V		1.3E+05	1.4E+09	1.3E+04	1		Acetonitrile	75-05-8							8.1E+02	8.1E+02
				1.0E-01	I			V		2.5E+03	1.4E+09	6.0E+04	1		Acetophenone	98-86-2					7.8E+03			7.8E+03
3.8E+00	C	1.3E-03	C								1.4E+09		1	0.1	Acetylaminofluorene, 2-	53-96-3	1.8E+01	6.5E+01	2.9E+05	1.4E+01				
				5.0E-04	I	2.0E-05	I	V		2.3E+04	1.4E+09	6.9E+03	1		Acrolein	107-02-8					3.9E+01		1.4E-01	1.4E-01
5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I		M		1.4E+09		1	0.1	Acrylamide	79-06-1	3.1E+01	1.2E+02	1.4E+06	2.4E+01	1.6E+02	6.6E+02	8.5E+06	1.3E+02
				5.0E-01	I	1.0E-03	I	V		1.1E+05	1.4E+09	9.5E+04	1		Acrylic Acid	79-10-7					3.9E+04		9.9E+01	9.9E+01
5.4E-01	I	6.8E-05	I	4.0E-02	A	2.0E-03	I	V		1.1E+04	1.4E+09	7.7E+03	1		Acrylonitrile	107-13-1	1.3E+02		3.2E+01	2.5E+01	3.1E+03		1.6E+01	1.6E+01
						6.0E-03	P				1.4E+09		1	0.1	Adiponitrile	111-69-3							8.5E+06	8.5E+06
5.6E-02	C			1.0E-02	I						1.4E+09		1	0.1	Alachlor	15972-60-8	1.2E+03	4.4E+03		9.7E+02	7.8E+02	3.3E+03		6.3E+02
				1.0E-03	I						1.4E+09		1	0.1	Aldicarb	116-06-3					7.8E+01	3.3E+02		6.3E+01
				1.0E-03	I						1.4E+09		1	0.1	Aldicarb Sulfone	1646-88-4					7.8E+01	3.3E+02		6.3E+01
											1.4E+09		1	0.1	Aldicarb sulfoxide	1646-87-3								
1.7E+01	I	4.9E-03	I	3.0E-05	I			V			1.4E+09	1.7E+06	1		Aldrin	309-00-2	4.1E+00		9.8E+01	3.9E+00	2.3E+00			2.3E+00
				5.0E-03	I	1.0E-04	X	V		1.1E+05	1.4E+09	3.4E+04	1		Allyl Alcohol	107-18-6					3.9E+02		3.6E+00	3.5E+00
2.1E-02	C	6.0E-06	C			1.0E-03	I	V		1.4E+03	1.4E+09	1.6E+03	1		Allyl Chloride	107-05-1	3.3E+03		7.4E+01	7.2E+01			1.7E+00	1.7E+00
				1.0E+00	P	5.0E-03	P				1.4E+09		1		Aluminum	7429-90-5					7.8E+04		7.1E+06	7.7E+04
				4.0E-04	I						1.4E+09		1		Aluminum Phosphide	20859-73-8					3.1E+01			3.1E+01
				9.0E-03	I						1.4E+09		1	0.1	Ametryn	834-12-8					7.0E+02	3.0E+03		5.7E+02
2.1E+01	C	6.0E-03	C								1.4E+09		1	0.1	Aminobiphenyl, 4-	92-67-1	3.3E+00	1.2E+01	6.4E+04	2.6E+00				
				8.0E-02	P						1.4E+09		1	0.1	Aminophenol, m-	591-27-5					6.3E+03	2.6E+04		5.1E+03
				4.0E-03	X						1.4E+09		1	0.1	Aminophenol, o-	95-55-6					3.1E+02	1.3E+03		2.5E+02
				2.0E-02	P						1.4E+09		1	0.1	Aminophenol, p-	123-30-8					1.6E+03	6.6E+03		1.3E+03
				2.5E-03	I						1.4E+09		1	0.1	Amitraz	33089-61-1					2.0E+02	8.2E+02		1.6E+02
						5.0E-01	I	V					1		Ammonia	7664-41-7								
				2.0E-01	I						1.4E+09		1		Ammonium Sulfamate	7773-06-0					1.6E+04			1.6E+04
						3.0E-03	X	V		1.4E+04	1.4E+09	2.6E+04	1		Amyl Alcohol, tert-	75-85-4							8.2E+01	8.2E+01
5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I				1.4E+09		1	0.1	Aniline	62-53-3	1.2E+04	4.3E+04	2.4E+08	9.5E+03	5.5E+02	2.3E+03	1.4E+06	4.4E+02
4.0E-02	P			2.0E-03	X						1.4E+09		1	0.1	Anthraquinone, 9,10-	84-65-1	1.7E+03	6.2E+03		1.4E+03	1.6E+02	6.6E+02		1.3E+02
				4.0E-04	I						1.4E+09		0.15		Antimony (metallic)	7440-36-0					3.1E+01			3.1E+01
				5.0E-04	H						1.4E+09		0.15		Antimony Pentoxide	1314-60-9					3.9E+01			3.9E+01
				4.0E-04	H						1.4E+09		0.15		Antimony Tetroxide	1332-81-6					3.1E+01			3.1E+01
						2.0E-04	I				1.4E+09		0.15		Antimony Trioxide	1309-64-4							2.8E+05	2.8E+05
1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C				1.4E+09		1	0.03	Arsenic, Inorganic	7440-38-2	7.7E+01	5.5E+02	8.9E+04	6.8E+01	3.9E+01	3.3E+02	2.1E+04	3.5E+01
				3.5E-06	C	5.0E-05	I				1.4E+09		1		Arsine	7784-42-1					2.7E-01		7.1E+04	2.7E-01
													1		Asbestos (units in fibers)	1332-21-4								
				3.6E-02	O						1.4E+09		1	0.1	Asulam	3337-71-1					2.8E+03	1.2E+04		2.3E+03
2.3E-01	C			3.5E-02	I						1.4E+09		1	0.1	Atrazine	1912-24-9	3.0E+02	1.1E+03		2.4E+02	2.7E+03	1.2E+04		2.2E+03
8.8E-01	C	2.5E-04	C								1.4E+09		1	0.1	Auramine	492-80-8	7.9E+01	2.8E+02	1.5E+06	6.2E+01				
				4.0E-04	I						1.4E+09		1	0.1	Avermectin B1	65195-55-3					3.1E+01	1.3E+02		2.5E+01
				3.0E-03	A	1.0E-02	A				1.4E+09		1	0.1	Azinphos-methyl	86-50-0					2.3E+02	9.9E+02	1.4E+07	1.9E+02
1.1E-01	I	3.1E-05	I					V			1.4E+09	5.2E+05	1		Azobenzene	103-33-3	6.3E+02		4.7E+03	5.6E+02				
				1.0E+00	P	7.0E-06	P				1.4E+09		1	0.1	Azodicarbonamide	123-77-3					7.8E+04	3.3E+05	9.9E+03	8.6E+03
				2.0E-01	I	5.0E-04	H				1.4E+09		0.07		Barium	7440-39-3					1.6E+04		7.1E+05	1.5E+04
				5.0E-03	O			V			1.4E+09	3.1E+05	1		Benfluralin	1861-40-1					3.9E+02			3.9E+02
				5.0E-02	I						1.4E+09		1	0.1	Benomyl	17804-35-2					3.9E+03	1.6E+04		3.2E+03
				2.0E-01	I						1.4E+09		1	0.1	Bensulfuron-methyl	83055-99-6					1.6E+04	6.6E+04		1.3E+04
				3.0E-02	I						1.4E+09		1	0.1	Bentazon	25057-89-0					2.3E+03	9.9E+03		1.9E+03
4.0E-03	P			1.0E-01	I			V		1.2E+03	1.4E+09	2.3E+04	1		Benzaldehyde	100-52-7	1.7E+04			1.7E+04	7.8E+03			7.8E+03
5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	V		1.8E+03	1.4E+09	3.5E+03	1		Benzene	71-43-2	1.3E+03		1.3E+02	1.2E+02	3.1E+02		1.1E+02	8.2E+01
1.0E-01	X			3.0E-04	X						1.4E+09		1	0.1	Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	7.0E+02	2.5E+03		5.4E+02	2.3E+01	9.9E+01		1.9E+01
				1.0E-03	P			V		1.3E+03	1.4E+09	1.9E+04	1		Benzenethiol	108-98-5					7.8E+01			7.8E+01
2.3E+02	I	6.7E-02	I	3.0E-03	I				M		1.4E+09		1	0.1	Benzidine	92-87-5	6.7E-02	2.6E-01	2.1E+03	5.3E-02	2.3E+02	9.9E+02		1.9E+02
				4.0E+00	I						1.4E+09		1	0.1	Benzoic Acid	65-85-0					3.1E+05	1.3E+06		2.5E+05
1.3E+01	I							V		3.2E+02	1.4E+09	6.8E+04	1		Benzotrichloride	98-07-7	5.3E+00			5.3E+00				
				1.0E-01	P						1.4E+09		1	0.1	Benzyl Alcohol	100-51-6					7.8E+03	3.3E+04		6.3E+03
1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	V		1.5E+03	1.4E+09	2.6E+04	1		Benzyl Chloride	100-44-7	4.1E+02		1.5E+02	1.1E+02	1.6E+02		2.7E+01	2.3E+01
		2.4E-03	I	2.0E-03	I	2.0E-05	I				1.4E+09		0.007		Beryllium and compounds	7440-41-7			1.6E+05	1.6E+05	1.6E+02		2.8E+04	1.6E+02
				9.0E-03	P						1.4E+09		1	0.1	Bifenox	42576-02-3					7.0E+02	3.0E+03		5.7E+02
				1.5E-02	I						1.4E+09		1	0.1	Biphenthrin	82657-04-3					1.2E+03	4.9E+03		9.5E+02
8.0E-03	I			5.0E-01	I	4.0E-04	X	V			1.4E+09	1.1E+05	1		Biphenyl, 1,1'-	92-52-4	8.7E+03			8.7E+03	3.9E+04		4.8E+01	4.7E+01
				4.0E-02	I			V		1.0E+03	1.4E+09	3.5E+04	1		Bis(2-chloro-1-methylethyl) ether	108-60-1					3.1E+03			3.1E+03
				3.0E-03	P						1.4E+09		1	0.1	Bis(2-chloroethoxy)methane	111-91-1					2.3E+02	9.9E+02		1.9E+02
1.1E+00	I	3.3E-04	I					V		5.1E+03	1.4E+09	4.3E+04	1		Bis(2-chloroethyl)ether	111-44-4	6.3E+01		3.6E+01	2.3E+01				
2.2E+02	I	6.2E-02	I					V		4.2E+03	1.4E+09	1.9E+03	1		Bis(chloromethyl)ether	542-88-1	3.2E-01		8.5E-03	8.3E-03				
				5.0E-02	I						1.4E+09		1	0.1	Bisphenol A	80-05-7					3.9E+03	1.6E+04		3.2E+03
				2.0E-01	I	2.0E-02	H				1.4E+09		1		Boron And Borates Only	7440-42-8					1.6E+04		2.8E+07	1.6E+04
				2.0E+00	P	2.0E-02	P	V			1.4E+09		1		Boron Trichloride	10294-34-5					1.6E+05		2.8E+07	1.6E+05
				4.0E-02	C	1.3E-02	C	V			1.4E+09		1		Boron Trifluoride	7637-07-2					3.1E+03		1.8E+07	3.1E+03
7.0E-01	I			4.0E-03	I						1.4E+09		1		Bromate	15541-45-4	9.9E+01			9.9E+01	3.1E+02			3.1E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
2.0E+00	X	6.0E-04	X					V		2.4E+03	1.4E+09	5.9E+03	1		Bromo-2-chloroethane, 1-	107-04-0	3.5E+01		2.8E+00	2.6E+00				
				3.0E-04	X			V		9.0E+02	1.4E+09	1.1E+04	1		Bromo-3-fluorobenzene, 1-	1073-06-9					2.3E+01			2.3E+01
				3.0E-04	X			V		3.2E+02	1.4E+09	1.1E+04	1		Bromo-4-fluorobenzene, 1-	460-00-4					2.3E+01			2.3E+01
											1.4E+09		1	0.1	Bromoacetic acid	79-08-3								
				8.0E-03	I	6.0E-02	I	V		6.8E+02	1.4E+09	8.4E+03	1		Bromobenzene	108-86-1					6.3E+02		5.2E+02	2.9E+02
						4.0E-02	X	V		4.0E+03	1.4E+09	3.6E+03	1		Bromochloromethane	74-97-5							1.5E+02	1.5E+02
6.2E-02	I	3.7E-05	C	2.0E-02	I			V		9.3E+02	1.4E+09	4.0E+03	1		Bromodichloromethane	75-27-4	1.1E+03		3.0E+01	2.9E+01	1.6E+03			1.6E+03
7.9E-03	I	1.1E-06	I	2.0E-02	I			V		9.2E+02	1.4E+09	9.7E+03	1		Bromoform	75-25-2	8.8E+03		2.5E+03	1.9E+03	1.6E+03			1.6E+03
				1.4E-03	I	5.0E-03	I	V		3.6E+03	1.4E+09	1.4E+03	1		Bromomethane	74-83-9					1.1E+02		7.3E+00	6.8E+00
				5.0E-03	H			V			1.4E+09	1.2E+05	1		Bromophos	2104-96-3					3.9E+02			3.9E+02
						1.0E-01	A	V		9.7E+02	1.4E+09	2.1E+03	1		Bromopropane, 1-	106-94-5							2.2E+02	2.2E+02
1.0E-01	O			1.5E-02	O						1.4E+09		1	0.1	Bromoxynil	1689-84-5	6.7E+02	2.4E+03		5.3E+02	1.2E+03	4.9E+03		9.5E+02
1.0E-01	O			1.5E-02	O			V			1.4E+09	4.7E+05	1		Bromoxynil Octanoate	1689-99-2	6.7E+02			6.7E+02	1.2E+03			1.2E+03
6.0E-01	C	3.0E-05	I			2.0E-03	I	V		6.7E+02	1.4E+09	8.7E+02	1		Butadiene, 1,3-	106-99-0	1.2E+02		8.1E+00	7.6E+00			1.8E+00	1.8E+00
				3.0E-02	O						1.4E+09		1	0.1	Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6					2.3E+03	9.9E+03		1.9E+03
				1.0E-01	I			V		7.6E+03	1.4E+09	3.0E+04	1		Butanol, N-	71-36-3					7.8E+03			7.8E+03
				2.0E+00	P	3.0E+01	P	V		2.1E+04	1.4E+09	2.9E+04	1		Butyl alcohol, sec-	78-92-2					1.6E+05		9.1E+05	1.3E+05
				5.0E-02	I			V			1.4E+09	8.6E+04	1		Butylate	2008-41-5					3.9E+03			3.9E+03
2.0E-04	C	5.7E-08	C								1.4E+09		1	0.1	Butylated hydroxyanisole	25013-16-5	3.5E+05	1.2E+06	6.7E+09	2.7E+05				
3.6E-03	P			3.0E-01	P						1.4E+09		1	0.1	Butylated hydroxytoluene	128-37-0	1.9E+04	6.9E+04		1.5E+04	2.3E+04	9.9E+04		1.9E+04
				5.0E-02	P			V		1.1E+02	1.4E+09	8.1E+03	1		Butylbenzene, n-	104-51-8					3.9E+03			3.9E+03
				1.0E-01	X			V		1.5E+02	1.4E+09	7.4E+03	1		Butylbenzene, sec-	135-98-8					7.8E+03			7.8E+03
				1.0E-01	X			V		1.8E+02	1.4E+09	7.4E+03	1		Butylbenzene, tert-	98-06-6					7.8E+03			7.8E+03
				2.0E-02	A						1.4E+09		1	0.1	Cacodylic Acid	75-60-5					1.6E+03	6.6E+03		1.3E+03
		1.8E-03	I	1.0E-03	I	1.0E-05	A				1.4E+09		0.025	0.001	Cadmium (Diet)	7440-43-9			2.1E+05	2.1E+05	7.8E+01	8.2E+02	1.4E+04	7.1E+01
		1.8E-03	I	5.0E-04	I	1.0E-05	A						0.05	0.001	Cadmium (Water)	7440-43-9								
				5.0E-01	I	2.2E-03	C				1.4E+09		1	0.1	Caprolactam	105-60-2					3.9E+04	1.6E+05	3.1E+06	3.1E+04
1.5E-01	C	4.3E-05	C	2.0E-03	I						1.4E+09		1	0.1	Captafol	2425-06-1	4.6E+02	1.6E+03	8.9E+06	3.6E+02	1.6E+02	6.6E+02		1.3E+02
2.3E-03	C	6.6E-07	C	1.3E-01	I						1.4E+09		1	0.1	Captan	133-06-2	3.0E+04	1.1E+05	5.8E+08	2.4E+04	1.0E+04	4.3E+04		8.2E+03
				1.0E-01	I						1.4E+09		1	0.1	Carbaryl	63-25-2					7.8E+03	3.3E+04		6.3E+03
				5.0E-03	I						1.4E+09		1	0.1	Carbofuran	1563-66-2					3.9E+02	1.6E+03		3.2E+02
				1.0E-01	I	7.0E-01	I	V		7.4E+02	1.4E+09	1.2E+03	1		Carbon Disulfide	75-15-0					7.8E+03		8.5E+02	7.7E+02
7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	V		4.6E+02	1.4E+09	1.5E+03	1		Carbon Tetrachloride	56-23-5	9.9E+02		7.0E+01	6.5E+01	3.1E+02		1.6E+02	1.0E+02
						1.0E-01	P	V		5.9E+03	1.4E+09	6.5E+02	1		Carbonyl Sulfide	463-58-1							6.7E+01	6.7E+01
				1.0E-02	I						1.4E+09		1	0.1	Carbosulfan	55285-14-8					7.8E+02	3.3E+03		6.3E+02
				1.0E-01	I						1.4E+09		1	0.1	Carboxin	5234-68-4					7.8E+03	3.3E+04		6.3E+03
						9.0E-04	I				1.4E+09		1		Ceric oxide	1306-38-3							1.3E+06	1.3E+06
				1.0E-01	I			V			1.4E+09	1.5E+05	1		Chloral Hydrate	302-17-0					7.8E+03			7.8E+03
				1.5E-02	I						1.4E+09		1	0.1	Chloramben	133-90-4					1.2E+03	4.9E+03		9.5E+02
											1.4E+09				Chloramines, Organic									
4.0E-01	H										1.4E+09		1	0.1	Chloranil	118-75-2	1.7E+02	6.1E+02		1.3E+02				
3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I	V			1.4E+09	1.5E+06	1	0.04	Chlordane	12789-03-6	2.0E+02	1.8E+03	4.3E+03	1.7E+02	3.9E+01	4.1E+02	1.1E+03	3.5E+01
1.0E+01	I	4.6E-03	C	3.0E-04	I						1.4E+09		1	0.1	Chlordecone (Kepone)	143-50-0	7.0E+00	2.5E+01	8.3E+04	5.4E+00	2.3E+01	9.9E+01		1.9E+01
				7.0E-04	A						1.4E+09		1	0.1	Chlorfenvinphos	470-90-6					5.5E+01	2.3E+02		4.4E+01
				9.0E-02	O						1.4E+09		1	0.1	Chlorimuron, Ethyl-	90982-32-4					7.0E+03	3.0E+04		5.7E+03
				1.0E-01	I	1.5E-04	A	V		2.8E+03	1.4E+09	1.2E+03	1		Chlorine	7782-50-5					7.8E+03		1.8E-01	1.8E-01
				3.0E-02	I	2.0E-04	I	V			1.4E+09		1		Chlorine Dioxide	10049-04-4					2.3E+03		2.8E+05	2.3E+03
				3.0E-02	I						1.4E+09		1		Chlorite (Sodium Salt)	7758-19-2					2.3E+03			2.3E+03
						5.0E+01	I	V		1.2E+03	1.4E+09	1.0E+03	1		Chloro-1,1-difluoroethane, 1-	75-68-3							5.4E+04	5.4E+04
		3.0E-04	I	2.0E-02	H	2.0E-02	I	V		7.9E+02	1.4E+09	1.1E+03	1		Chloro-1,3-butadiene, 2-	126-99-8			1.0E+00	1.0E+00	1.6E+03		2.2E+01	2.2E+01
4.6E-01	H										1.4E+09		1	0.1	Chloro-2-methylaniline HCl, 4-	3165-93-3	1.5E+02	5.4E+02		1.2E+02				
1.0E-01	P	7.7E-05	C	3.0E-03	X						1.4E+09		1	0.1	Chloro-2-methylaniline, 4-	95-69-2	7.0E+02	2.5E+03	5.0E+06	5.4E+02	2.3E+02	9.9E+02		1.9E+02
2.7E-01	X							V		1.2E+04	1.4E+09	1.6E+04	1		Chloroacetaldehyde, 2-	107-20-0	2.6E+02			2.6E+02				
											1.4E+09		1	0.1	Chloroacetic Acid	79-11-8								
						3.0E-05	I				1.4E+09		1	0.1	Chloroacetophenone, 2-	532-27-4							4.3E+04	4.3E+04
2.0E-01	P			4.0E-03	I						1.4E+09		1	0.1	Chloroaniline, p-	106-47-8	3.5E+02	1.2E+03		2.7E+02	3.1E+02	1.3E+03		2.5E+02
				2.0E-02	I	5.0E-02	P	V		7.6E+02	1.4E+09	6.5E+03	1		Chlorobenzene	108-90-7					1.6E+03		3.4E+02	2.8E+02
				1.0E-01	X						1.4E+09		1	0.1	Chlorobenzene sulfonic acid, p-	98-66-8					7.8E+03	3.3E+04		6.3E+03
1.1E-01	C	3.1E-05	C	2.0E-02	I						1.4E+09		1	0.1	Chlorobenzilate	510-15-6	6.3E+02	2.2E+03	1.2E+07	4.9E+02	1.6E+03	6.6E+03		1.3E+03
				3.0E-02	X						1.4E+09		1	0.1	Chlorobenzoic Acid, p-	74-11-3					2.3E+03	9.9E+03		1.9E+03
				3.0E-03	P	3.0E-01	P	V		2.9E+02	1.4E+09	6.8E+03	1		Chlorobenzotrifluoride, 4-	98-56-6					2.3E+02		2.1E+03	2.1E+02
				4.0E-02	P			V		7.3E+02	1.4E+09	1.8E+03	1		Chlorobutane, 1-	109-69-3					3.1E+03			3.1E+03
						5.0E+01	I	V		1.7E+03	1.4E+09	9.4E+02	1		Chlorodifluoromethane	75-45-6							4.9E+04	4.9E+04
				2.0E-02	P			V		1.1E+05	1.4E+09	7.8E+04	1		Chloroethanol, 2-	107-07-3					1.6E+03			1.6E+03
3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	V		2.5E+03	1.4E+09	2.6E+03	1		Chloroform	67-66-3	2.2E+03		3.2E+01	3.2E+01	7.8E+02		2.7E+02	2.0E+02
						9.0E-02	I	V		1.3E+03	1.4E+09	1.2E+03	1		Chloromethane	74-87-3							1.1E+02	1.1E+02
2.4E+00	C	6.9E-04	C					V		9.3E+03	1.4E+09	5.3E+03	1		Chloromethyl Methyl Ether	107-30-2	2.9E+01		2.2E+00	2.0E+00				
3.0E-01	P			3.0E-03	P	1.0E-05	X				1.4E+09		1	0.1	Chloronitrobenzene, o-	88-73-3	2.3E+02	8.2E+02		1.8E+02	2.3E+02	9.9E+02	1.4E+04	1.9E+02
6.0E-02	P			7.0E-04	P	2.0E-03	P				1.4E+09		1	0.1	Chloronitrobenzene, p-	100-00-5	1.2E+03	4.1E+03		9.0E+02	5.5E+01	2.3E+02	2.8E+06	4.4E+01
				5.0E-03	I			V		2.7E+04	1.4E+09	1.4E+05	1		Chlorophenol, 2-	95-57-8					3.9E+02			3.9E+02
						4.0E-04	C	V		6.2E+02	1.4E+09	4.7E+03	1		Chloropicrin	76-06-2							2.0E+00	2.0E+00
3.1E-03	C	8.9E-07	C	1.5E-02	I						1.4E+09		1	0.1	Chlorothalonil	1897-45-6	2.2E+04	8.0E+04	4.3E+08	1.8E+04	1.2E+03	4.9E+03		9.5E+02
				2.0E-02	I			V		9.1E+02	1.4E+09	8.1E+03	1		Chlorotoluene, o-	95-49-8					1.6E+03			1.6E+03
				2.0E-02	X			V		2.5E+02	1.4E+09	7.3E+03	1		Chlorotoluene, p-	106-43-4					1.6E+03			1.6E+03

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
2.4E+02	C	6.9E-02	C								1.4E+09		1	0.1	Chlorozotocin	54749-90-5	2.9E-01	1.0E+00	5.5E+03	2.3E-01				
				5.0E-02	O						1.4E+09		1	0.1	Chlorpropham	101-21-3					3.9E+03	1.6E+04		3.2E+03
				1.0E-03	A						1.4E+09		1	0.1	Chlorpyrifos	2921-88-2					7.8E+01	3.3E+02		6.3E+01
				1.0E-02	H						1.4E+09		1	0.1	Chlorpyrifos Methyl	5598-13-0					7.8E+02	3.3E+03		6.3E+02
				5.0E-02	O						1.4E+09		1	0.1	Chlorsulfuron	64902-72-3					3.9E+03	1.6E+04		3.2E+03
				1.0E-02	I						1.4E+09		1	0.1	Chlorthal-dimethyl	1861-32-1					7.8E+02	3.3E+03		6.3E+02
				8.0E-04	H						1.4E+09		1	0.1	Chlorthiophos	60238-56-4					6.3E+01	2.6E+02		5.1E+01
				1.5E+00	I						1.4E+09		0.013		Chromium(III), Insoluble Salts	16065-83-1					1.2E+05			1.2E+05
5.0E-01	C	8.4E-02	G	3.0E-03	I	1.0E-04	I		M		1.4E+09		0.025		Chromium(VI)	18540-29-9	3.1E+01		1.6E+03	3.0E+01	2.3E+02		1.4E+05	2.3E+02
											1.4E+09		0.013		Chromium, Total	7440-47-3								
				1.3E-02	I						1.4E+09		1	0.1	Clofentezine	74115-24-5					1.0E+03	4.3E+03		8.2E+02
		9.0E-03	P	3.0E-04	P	6.0E-06	P				1.4E+09		1		Cobalt	7440-48-4			4.2E+04	4.2E+04	2.3E+01		8.5E+03	2.3E+01
		6.2E-04	I					V	M				1		Coke Oven Emissions	8007-45-2								
				4.0E-02	H						1.4E+09		1		Copper	7440-50-8					3.1E+03			3.1E+03
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, m-	108-39-4					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, o-	95-48-7					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresol, p-	106-44-5					7.8E+03	3.3E+04	8.5E+08	6.3E+03
				1.0E-01	A						1.4E+09		1	0.1	Cresol, p-chloro-m-	59-50-7					7.8E+03	3.3E+04		6.3E+03
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresols	1319-77-3					7.8E+03	3.3E+04	8.5E+08	6.3E+03
1.9E+00	H			1.0E-03	P			V		1.7E+04	1.4E+09	1.9E+04	1		Crotonaldehyde, trans-	123-73-9	3.7E+01			3.7E+01	7.8E+01			7.8E+01
				1.0E-01	I	4.0E-01	I	V		2.7E+02	1.4E+09	6.2E+03	1		Cumene	98-82-8					7.8E+03		2.6E+03	1.9E+03
2.2E-01	C	6.3E-05	C								1.4E+09		1	0.1	Cupferron	135-20-6	3.2E+02	1.1E+03	6.1E+06	2.5E+02				
8.4E-01	H			2.0E-03	H						1.4E+09		1	0.1	Cyanazine	21725-46-2	8.3E+01	2.9E+02		6.5E+01	1.6E+02	6.6E+02		1.3E+02
															Cyanides									
				1.0E-03	I						1.4E+09		1		~Calcium Cyanide	592-01-8					7.8E+01			7.8E+01
				5.0E-03	I						1.4E+09		1		~Copper Cyanide	544-92-3					3.9E+02			3.9E+02
				6.0E-04	I	8.0E-04	G	V		9.5E+05	1.4E+09	5.3E+04	1		~Cyanide (CN-)	57-12-5					4.7E+01		4.4E+01	2.3E+01
				1.0E-03	I			V			1.4E+09		1		~Cyanogen	460-19-5					7.8E+01			7.8E+01
				9.0E-02	I			V			1.4E+09		1		~Cyanogen Bromide	506-68-3					7.0E+03			7.0E+03
				5.0E-02	I			V			1.4E+09		1		~Cyanogen Chloride	506-77-4					3.9E+03			3.9E+03
				6.0E-04	I	8.0E-04	I	V		1.0E+07	1.4E+09	5.2E+04	1		~Hydrogen Cyanide	74-90-8					4.7E+01		4.4E+01	2.3E+01
				2.0E-03	I						1.4E+09		1		~Potassium Cyanide	151-50-8					1.6E+02			1.6E+02
				5.0E-03	I						1.4E+09		0.04		~Potassium Silver Cyanide	506-61-6					3.9E+02			3.9E+02
				1.0E-01	I						1.4E+09		0.04		~Silver Cyanide	506-64-9					7.8E+03			7.8E+03
				1.0E-03	I						1.4E+09		1		~Sodium Cyanide	143-33-9					7.8E+01			7.8E+01
				2.0E-04	P						1.4E+09		1		~Thiocyanates	E1790664					1.6E+01			1.6E+01
				2.0E-04	X			V			1.4E+09		1		~Thiocyanic Acid	463-56-9					1.6E+01			1.6E+01
				5.0E-02	I						1.4E+09		1		~Zinc Cyanide	557-21-1					3.9E+03			3.9E+03
						6.0E+00	I	V		1.2E+02	1.4E+09	1.0E+03	1		Cyclohexane	110-82-7							6.5E+03	6.5E+03
2.0E-02	X			2.0E-02	X						1.4E+09		1	0.1	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	3.5E+03	1.2E+04		2.7E+03	1.6E+03	6.6E+03		1.3E+03
				5.0E+00	I	7.0E-01	P	V		5.1E+03	1.4E+09	4.2E+04	1		Cyclohexanone	108-94-1					3.9E+05		3.0E+04	2.8E+04
				5.0E-03	P	1.0E+00	X	V		2.8E+02	1.4E+09	1.5E+03	1		Cyclohexene	110-83-8					3.9E+02		1.5E+03	3.1E+02
				2.0E-01	I			V		2.9E+05	1.4E+09	7.5E+04	1		Cyclohexylamine	108-91-8					1.6E+04			1.6E+04
				2.5E-02	I						1.4E+09		1	0.1	Cyfluthrin	68359-37-5					2.0E+03	8.2E+03		1.6E+03
				1.0E-03	O						1.4E+09		1	0.1	Cyhalothrin	68085-85-8					7.8E+01	3.3E+02		6.3E+01
				5.0E-01	O						1.4E+09		1	0.1	Cyromazine	66215-27-8					3.9E+04	1.6E+05		3.2E+04
2.4E-01	I	6.9E-05	C	3.0E-05	X						1.4E+09		1	0.1	DDD, p,p'- (DDD)	72-54-8	2.9E+02	1.0E+03	5.5E+06	2.3E+02	2.3E+00	9.9E+00		1.9E+00
3.4E-01	I	9.7E-05	C	3.0E-04	X			V			1.4E+09	2.1E+06	1		DDE, p,p'-	72-55-9	2.0E+02		6.1E+03	2.0E+02	2.3E+01			2.3E+01
3.4E-01	I	9.7E-05	I	5.0E-04	I						1.4E+09		1	0.03	DDT	50-29-3	2.0E+02	2.4E+03	3.9E+06	1.9E+02	3.9E+01	5.5E+02		3.7E+01
				3.0E-02	I						1.4E+09		1	0.1	Dalapon	75-99-0					2.3E+03	9.9E+03		1.9E+03
1.8E-02	C	5.1E-06	C	1.5E-01	I						1.4E+09		1	0.1	Daminozide	1596-84-5	3.9E+03	1.4E+04	7.5E+07	3.0E+03	1.2E+04	4.9E+04		9.5E+03
7.0E-04	I			7.0E-03	I						1.4E+09		1	0.1	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	9.9E+04	3.5E+05		7.8E+04	5.5E+02	2.3E+03		4.4E+02
				4.0E-05	I						1.4E+09		1	0.1	Demeton	8065-48-3					3.1E+00	1.3E+01		2.5E+00
1.2E-03	I			6.0E-01	I						1.4E+09		1	0.1	Di(2-ethylhexyl)adipate	103-23-1	5.8E+04	2.1E+05		4.5E+04	4.7E+04	2.0E+05		3.8E+04
6.1E-02	H										1.4E+09		1	0.1	Diallate	2303-16-4	1.1E+03	4.1E+03		8.9E+02				
				7.0E-04	A						1.4E+09		1	0.1	Diazinon	333-41-5					5.5E+01	2.3E+02		4.4E+01
				1.0E-02	X			V			1.4E+09	5.2E+05	1		Dibenzothiophene	132-65-0					7.8E+02			7.8E+02
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	9.8E+02	1.4E+09	3.2E+04	1		Dibromo-3-chloropropane, 1,2-	96-12-8	1.9E+01		5.4E-01	5.3E-01	1.6E+01		6.7E+00	4.7E+00
											1.4E+09		1	0.1	Dibromoacetic acid	631-64-1								
				4.0E-04	X			V		1.6E+02	1.4E+09	1.9E+04	1		Dibromobenzene, 1,3-	108-36-1					3.1E+01			3.1E+01
				1.0E-02	I			V			1.4E+09	2.2E+04	1		Dibromobenzene, 1,4-	106-37-6					7.8E+02			7.8E+02
8.4E-02	I			2.0E-02	I			V		8.0E+02	1.4E+09	8.0E+03	1		Dibromochloromethane	124-48-1	8.3E+02			8.3E+02	1.6E+03			1.6E+03
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1.3E+03	1.4E+09	8.6E+03	1		Dibromoethane, 1,2-	106-93-4	3.5E+01		4.0E+00	3.6E+00	7.0E+02		8.1E+01	7.3E+01
						4.0E-03	X	V		2.8E+03	1.4E+09	5.6E+03	1		Dibromomethane (Methylene Bromide)	74-95-3							2.4E+01	2.4E+01
				3.0E-04	P						1.4E+09		1	0.1	Dibutyltin Compounds	E1790660					2.3E+01	9.9E+01		1.9E+01
				3.0E-02	I						1.4E+09		1	0.1	Dicamba	1918-00-9					2.3E+03	9.9E+03		1.9E+03
											1.4E+09				Dichloramine	3400-09-7								
		4.2E-03	P					V		5.5E+02	1.4E+09	3.2E+03	1		Dichloro-2-butene, 1,4-	764-41-0			2.1E-01	2.1E-01				
		4.2E-03	P					V		5.2E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, cis-1,4-	1476-11-5			7.4E-01	7.4E-01				
		4.2E-03	P					V		7.6E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, trans-1,4-	110-57-6			7.4E-01	7.4E-01				
5.0E-02	I			4.0E-03	I						1.4E+09		1	0.1	Dichloroacetic Acid	79-43-6	1.4E+03	4.9E+03		1.1E+03	3.1E+02	1.3E+03		2.5E+02
				9.0E-02	I	2.0E-01	H	V		3.8E+02	1.4E+09	1.2E+04	1		Dichlorobenzene, 1,2-	95-50-1					7.0E+03		2.4E+03	1.8E+03
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V			1.4E+09	1.0E+04	1		Dichlorobenzene, 1,4-	106-46-7	1.3E+04		2.7E+02	2.6E+02	5.5E+03		8.7E+03	3.4E+03
4.5E-01	I	3.4E-04	C								1.4E+09		1	0.1	Dichlorobenzidine, 3,3'-	91-94-1	1.5E+02	5.5E+02	1.1E+06	1.2E+02				

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				9.0E-03	X						1.4E+09		1	0.1	Dichlorobenzophenone, 4,4'-	90-98-2					7.0E+02	3.0E+03		5.7E+02
				2.0E-01	I	1.0E-01	X	V		8.5E+02	1.4E+09	8.4E+02	1		Dichlorodifluoromethane	75-71-8					1.6E+04		8.8E+01	8.7E+01
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1.7E+03	1.4E+09	2.1E+03	1		Dichloroethane, 1,1-	75-34-3	1.2E+04		3.7E+02	3.6E+02	1.6E+04			1.6E+04
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		3.0E+03	1.4E+09	4.6E+03	1		Dichloroethane, 1,2-	107-06-2	7.6E+02		4.9E+01	4.6E+01	4.7E+02		3.3E+01	3.1E+01
				5.0E-02	I	2.0E-01	I	V		1.2E+03	1.4E+09	1.2E+03	1		Dichloroethylene, 1,1-	75-35-4					3.9E+03		2.4E+02	2.3E+02
				2.0E-03	I			V		2.4E+03	1.4E+09	2.5E+03	1		Dichloroethylene, 1,2-cis-	156-59-2					1.6E+02			1.6E+02
				2.0E-02	I			V		1.9E+03	1.4E+09	1.8E+03	1		Dichloroethylene, 1,2-trans-	156-60-5					1.6E+03			1.6E+03
				3.0E-03	I						1.4E+09		1	0.1	Dichlorophenol, 2,4-	120-83-2					2.3E+02	9.9E+02		1.9E+02
				1.0E-02	I						1.4E+09		1	0.05	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					7.8E+02	6.6E+03		7.0E+02
3.7E-02	P	3.7E-06	P	4.0E-02	P	4.0E-03	I	V		1.4E+03	1.4E+09	3.8E+03	1		Dichloropropane, 1,2-	78-87-5	1.9E+03		2.9E+02	2.5E+02	3.1E+03		1.6E+01	1.6E+01
				2.0E-02	P			V		1.5E+03	1.4E+09	6.8E+03	1		Dichloropropane, 1,3-	142-28-9					1.6E+03			1.6E+03
				3.0E-03	I						1.4E+09		1	0.1	Dichloropropanol, 2,3-	616-23-9					2.3E+02	9.9E+02		1.9E+02
1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		1.6E+03	1.4E+09	3.6E+03	1		Dichloropropene, 1,3-	542-75-6	7.0E+02		2.5E+02	1.8E+02	2.3E+03		7.4E+01	7.2E+01
2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I				1.4E+09		1	0.1	Dichlorvos	62-73-7	2.4E+02	8.5E+02	4.6E+06	1.9E+02	3.9E+01	1.6E+02	7.1E+05	3.2E+01
				3.0E-05	O						1.4E+09		1	0.1	Dicrotophos	141-66-2					2.3E+00	9.9E+00		1.9E+00
				8.0E-02	P	3.0E-04	X	V		2.6E+02	1.4E+09	4.1E+03	1		Dicyclopentadiene	77-73-6					6.3E+03		1.3E+00	1.3E+00
1.6E+01	I	4.6E-03	I	5.0E-05	I						1.4E+09		1	0.1	Dieldrin	60-57-1	4.3E+00	1.5E+01	8.3E+04	3.4E+00	3.9E+00	1.6E+01		3.2E+00
		3.0E-04	C			5.0E-03	I							0.1	Diesel Engine Exhaust	E17136615								
				2.0E-03	P	2.0E-04	P				1.4E+09		1	0.1	Diethanolamine	111-42-2					1.6E+02	6.6E+02	2.8E+05	1.3E+02
				3.0E-02	P	1.0E-04	P				1.4E+09		1	0.1	Diethylene Glycol Monobutyl Ether	112-34-5					2.3E+03	9.9E+03	1.4E+05	1.9E+03
				6.0E-02	P	3.0E-04	P				1.4E+09		1	0.1	Diethylene Glycol Monoethyl Ether	111-90-0					4.7E+03	2.0E+04	4.3E+05	3.8E+03
				1.0E-03	P			V		1.1E+05	1.4E+09	1.4E+05	1		Diethylformamide	617-84-5					7.8E+01			7.8E+01
3.5E+02	C	1.0E-01	C								1.4E+09		1	0.1	Diethylstilbestrol	56-53-1	2.0E-01	7.1E-01	3.8E+03	1.6E-01				
				8.3E-02	O						1.4E+09		1	0.1	Difenzoquat	43222-48-6					6.5E+03	2.7E+04		5.2E+03
				2.0E-02	I						1.4E+09		1	0.1	Diflubenzuron	35367-38-5					1.6E+03	6.6E+03		1.3E+03
						4.0E+01	I	V		1.4E+03	1.4E+09	1.2E+03	1		Difluoroethane, 1,1-	75-37-6							4.8E+04	4.8E+04
						3.0E+01	X	V		6.9E+02	1.4E+09	7.6E+02	1		Difluoropropane, 2,2-	420-45-1							2.4E+04	2.4E+04
4.4E-02	C	1.3E-05	C					V			1.4E+09	1.2E+05	1		Dihydrosafrole	94-58-6	1.6E+03		2.7E+03	9.9E+02				
						7.0E-01	P	V		2.3E+03	1.4E+09	3.1E+03	1		Diisopropyl Ether	108-20-3							2.2E+03	2.2E+03
				8.0E-02	I			V		5.3E+02	1.4E+09	3.8E+04	1		Diisopropyl Methylphosphonate	1445-75-6					6.3E+03			6.3E+03
				2.2E-02	O						1.4E+09		1	0.1	Dimethipin	55290-64-7					1.7E+03	7.2E+03		1.4E+03
				2.2E-03	O						1.4E+09		1	0.1	Dimethoate	60-51-5					1.7E+02	7.3E+02		1.4E+02
1.6E+00	P										1.4E+09		1	0.1	Dimethoxybenzidine, 3,3'-	119-90-4	4.3E+01	1.5E+02		3.4E+01				
1.7E-03	P			6.0E-02	P						1.4E+09		1	0.1	Dimethyl methylphosphonate	756-79-6	4.1E+04	1.5E+05		3.2E+04	4.7E+03	2.0E+04		3.8E+03
4.6E+00	C	1.3E-03	C								1.4E+09		1	0.1	Dimethylamino azobenzene [p-]	60-11-7	1.5E+01	5.4E+01	2.9E+05	1.2E+01				
5.8E-01	H										1.4E+09		1	0.1	Dimethylaniline HCl, 2,4-	21436-96-4	1.2E+02	4.3E+02		9.4E+01				
2.0E-01	P			2.0E-03	X						1.4E+09		1	0.1	Dimethylaniline, 2,4-	95-68-1	3.5E+02	1.2E+03		2.7E+02	1.6E+02	6.6E+02		1.3E+02
2.7E-02	P			2.0E-03	I			V		8.3E+02	1.4E+09	3.1E+04	1		Dimethylaniline, N,N-	121-69-7	2.6E+03			2.6E+03	1.6E+02			1.6E+02
1.1E+01	P										1.4E+09		1	0.1	Dimethylbenzidine, 3,3'-	119-93-7	6.3E+00	2.2E+01		4.9E+00				
				1.0E-01	P	3.0E-02	I	V		1.1E+05	1.4E+09	1.3E+05	1		Dimethylformamide	68-12-2					7.8E+03		4.0E+03	2.6E+03
				1.0E-04	X	2.0E-06	X	V		1.7E+05	1.4E+09	2.8E+04	1		Dimethylhydrazine, 1,1-	57-14-7					7.8E+00		5.8E-02	5.7E-02
5.5E+02	C	1.6E-01	C					V		1.9E+05	1.4E+09	1.7E+05	1		Dimethylhydrazine, 1,2-	540-73-8	1.3E-01		2.9E-01	8.8E-02				
				2.0E-02	I						1.4E+09		1	0.1	Dimethylphenol, 2,4-	105-67-9					1.6E+03	6.6E+03		1.3E+03
				6.0E-04	I						1.4E+09		1	0.1	Dimethylphenol, 2,6-	576-26-1					4.7E+01	2.0E+02		3.8E+01
				1.0E-03	I						1.4E+09		1	0.1	Dimethylphenol, 3,4-	95-65-8					7.8E+01	3.3E+02		6.3E+01
4.5E-02	C	1.3E-05	C					V		4.7E+02	1.4E+09	5.5E+03	1		Dimethylvinylchloride	513-37-1	1.5E+03		1.2E+02	1.1E+02				
				8.0E-05	X						1.4E+09		1	0.1	Dinitro-o-cresol, 4,6-	534-52-1					6.3E+00	2.6E+01		5.1E+00
				2.0E-03	I						1.4E+09		1	0.1	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5					1.6E+02	6.6E+02		1.3E+02
				1.0E-04	P						1.4E+09		1	0.1	Dinitrobenzene, 1,2-	528-29-0					7.8E+00	3.3E+01		6.3E+00
				1.0E-04	I						1.4E+09		1	0.1	Dinitrobenzene, 1,3-	99-65-0					7.8E+00	3.3E+01		6.3E+00
				1.0E-04	P						1.4E+09		1	0.1	Dinitrobenzene, 1,4-	100-25-4					7.8E+00	3.3E+01		6.3E+00
				2.0E-03	I						1.4E+09		1	0.1	Dinitrophenol, 2,4-	51-28-5					1.6E+02	6.6E+02		1.3E+02
6.8E-01	I										1.4E+09		1	0.1	Dinitrotoluene Mixture, 2,4/2,6-	E1615210	1.0E+02	3.6E+02		8.0E+01				
3.1E-01	C	8.9E-05	C	2.0E-03	I						1.4E+09		1	0.102	Dinitrotoluene, 2,4-	121-14-2	2.2E+02	7.8E+02	4.3E+06	1.7E+02	1.6E+02	6.5E+02		1.3E+02
1.5E+00	P			3.0E-04	X						1.4E+09		1	0.099	Dinitrotoluene, 2,6-	606-20-2	4.6E+01	1.7E+02		3.6E+01	2.3E+01	1.0E+02		1.9E+01
				2.0E-03	G						1.4E+09		1	0.006	Dinitrotoluene, 2-Amino-4,6-	35572-78-2					1.6E+02	1.1E+04		1.5E+02
				2.0E-03	G						1.4E+09		1	0.009	Dinitrotoluene, 4-Amino-2,6-	19406-51-0					1.6E+02	7.3E+03		1.5E+02
4.5E-01	X			9.0E-04	X						1.4E+09		1	0.1	Dinitrotoluene, Technical grade	25321-14-6	1.5E+02	5.5E+02		1.2E+02	7.0E+01	3.0E+02		5.7E+01
				1.0E-03	I						1.4E+09		1	0.1	Dinoseb	88-85-7					7.8E+01	3.3E+02		6.3E+01
1.0E-01	I	5.0E-06	I	3.0E-02	I	3.0E-02	I	V		1.2E+05	1.4E+09	4.0E+04	1		Dioxane, 1,4-	123-91-1	7.0E+02		2.2E+03	5.3E+02	2.3E+03		1.2E+03	8.1E+02
															Dioxins									
6.2E+03	I	1.3E+00	I								1.4E+09		1	0.03	~Hexachlorodibenzo-p-dioxin, Mixture		1.1E-02	1.3E-01	2.9E+02	1.0E-02				
1.3E+05	C	3.8E+01	C	7.0E-10	I	4.0E-08	C	V			1.4E+09	2.0E+06	1	0.03	~TCDD, 2,3,7,8-	1746-01-6	5.3E-04	6.3E-03	1.4E-02	4.8E-04	5.5E-05	7.7E-04	8.2E-02	5.1E-05
				3.0E-02	I						1.4E+09		1	0.1	Diphenamid	957-51-7					2.3E+03	9.9E+03		1.9E+03
						4.0E-04	X	V			1.4E+09	8.1E+04	1		Diphenyl Ether	101-84-8							3.4E+01	3.4E+01
				8.0E-04	X						1.4E+09		1	0.1	Diphenyl Sulfone	127-63-9					6.3E+01	2.6E+02		5.1E+01
				1.0E-01	O						1.4E+09		1	0.1	Diphenylamine	122-39-4					7.8E+03	3.3E+04		6.3E+03
8.0E-01	I	2.2E-04	I								1.4E+09		1	0.1	Diphenylhydrazine, 1,2-	122-66-7	8.7E+01	3.1E+02	1.7E+06	6.8E+01				
				2.2E-03	I						1.4E+09		1	0.1	Diquat	85-00-7					1.7E+02	7.3E+02		1.4E+02
7.1E+00	C	1.4E-01	C								1.4E+09		1	0.1	Direct Black 38	1937-37-7	9.8E+00	3.5E+01	2.7E+03	7.6E+00				
7.4E+00	C	1.4E-01	C								1.4E+09		1	0.1	Direct Blue 6	2602-46-2	9.4E+00	3.3E+01	2.7E+03	7.3E+00				
6.7E+00	C	1.4E-01	C								1.4E+09		1	0.1	Direct Brown 95	16071-86-6	1.0E+01	3.7E+01	2.7E+03	8.1E+00				
				4.0E-05	I						1.4E+09		1	0.1	Disulfoton	298-04-4					3.1E+00	1.3E+01		2.5E+00
				1.0E-02	I			V			1.4E+09	4.5E+04	1		Dithiane, 1,4-	505-29-3					7.8E+02			7.8E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				2.0E-03	I						1.4E+09		1	0.1	Diuron	330-54-1					1.6E+02	6.6E+02		1.3E+02
				2.0E-02	O						1.4E+09		1	0.1	Dodine	2439-10-3					1.6E+03	6.6E+03		1.3E+03
				5.0E-02	O			V			1.4E+09	1.2E+05	1		EPTC	759-94-4					3.9E+03			3.9E+03
				6.0E-03	I			V			1.4E+09	4.1E+05	1		Endosulfan	115-29-7					4.7E+02			4.7E+02
				6.0E-03	P						1.4E+09		1	0.1	Endosulfan Sulfate	1031-07-8					4.7E+02	2.0E+03		3.8E+02
				2.0E-02	I						1.4E+09		1	0.1	Endothall	145-73-3					1.6E+03	6.6E+03		1.3E+03
				3.0E-04	I						1.4E+09		1	0.1	Endrin	72-20-8					2.3E+01	9.9E+01		1.9E+01
9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	V		1.1E+04	1.4E+09	1.9E+04	1		Epichlorohydrin	106-89-8	7.0E+03		4.4E+03	2.7E+03	4.7E+02		2.0E+01	1.9E+01
						2.0E-02	I	V		1.5E+04	1.4E+09	7.7E+03	1		Epoxybutane, 1,2-	106-88-7							1.6E+02	1.6E+02
				4.0E-02	P						1.4E+09		1	0.1	Ethanol, 2-(2-methoxyethoxy)-	111-77-3					3.1E+03	1.3E+04		2.5E+03
				5.0E-03	I						1.4E+09		1	0.1	Ethephon	16672-87-0					3.9E+02	1.6E+03		3.2E+02
				5.0E-04	I						1.4E+09		1	0.1	Ethion	563-12-2					3.9E+01	1.6E+02		3.2E+01
				1.0E-01	P	6.0E-02	P	V		2.4E+04	1.4E+09	6.2E+04	1		Ethoxyethanol Acetate, 2-	111-15-9					7.8E+03		3.8E+03	2.6E+03
				9.0E-02	P	2.0E-01	I	V		1.1E+05	1.4E+09	9.8E+04	1		Ethoxyethanol, 2-	110-80-5					7.0E+03		2.1E+04	5.2E+03
				9.0E-01	I	7.0E-02	P	V		1.1E+04	1.4E+09	8.6E+03	1		Ethyl Acetate	141-78-6					7.0E+04		6.3E+02	6.2E+02
				5.0E-03	P	8.0E-03	P	V		2.5E+03	1.4E+09	6.3E+03	1		Ethyl Acrylate	140-88-5					3.9E+02		5.3E+01	4.7E+01
						1.0E+01	I	V		2.1E+03	1.4E+09	1.3E+03	1		Ethyl Chloride (Chloroethane)	75-00-3							1.4E+04	1.4E+04
				2.0E-01	I			V		1.0E+04	1.4E+09	3.1E+03	1		Ethyl Ether	60-29-7					1.6E+04			1.6E+04
						3.0E-01	P	V		1.1E+03	1.4E+09	5.8E+03	1		Ethyl Methacrylate	97-63-2							1.8E+03	1.8E+03
				1.0E-05	I						1.4E+09		1	0.1	Ethyl-p-nitrophenyl Phosphonate	2104-64-5					7.8E-01	3.3E+00		6.3E-01
1.1E-02	C	2.5E-06	C	1.0E-01	I	1.0E+00	I	V		4.8E+02	1.4E+09	5.7E+03	1		Ethylbenzene	100-41-4	6.3E+03		6.4E+02	5.8E+02	7.8E+03		5.9E+03	3.4E+03
				7.0E-02	P						1.4E+09		1	0.1	Ethylene Cyanohydrin	109-78-4					5.5E+03	2.3E+04		4.4E+03
				9.0E-02	P			V		1.9E+05	1.4E+09	1.8E+05	1		Ethylene Diamine	107-15-3					7.0E+03			7.0E+03
				2.0E+00	I	4.0E-01	C				1.4E+09		1	0.1	Ethylene Glycol	107-21-1					1.6E+05	6.6E+05	5.7E+08	1.3E+05
				1.0E-01	I	1.6E+00	I				1.4E+09		1	0.1	Ethylene Glycol Monobutyl Ether	111-76-2					7.8E+03	3.3E+04	2.3E+09	6.3E+03
3.1E-01	C	3.0E-03	I			3.0E-02	C	V	M	1.2E+05	1.4E+09	6.1E+03	1		Ethylene Oxide	75-21-8	4.9E+01		2.1E-01	2.0E-01			1.9E+02	1.9E+02
4.5E-02	C	1.3E-05	C	8.0E-05	I						1.4E+09		1	0.1	Ethylene Thiourea	96-45-7	1.5E+03	5.5E+03	2.9E+07	1.2E+03	6.3E+00	2.6E+01		5.1E+00
6.5E+01	C	1.9E-02	C					V		1.5E+05	1.4E+09	2.4E+04	1		Ethyleneimine	151-56-4	1.1E+00		3.5E-01	2.7E-01				
				3.0E+00	I						1.4E+09		1	0.1	Ethylphthalyl Ethyl Glycolate	84-72-0					2.3E+05	9.9E+05		1.9E+05
				2.5E-04	I						1.4E+09		1	0.1	Fenamiphos	22224-92-6					2.0E+01	8.2E+01		1.6E+01
				2.5E-02	I						1.4E+09		1	0.1	Fenpropathrin	39515-41-8					2.0E+03	8.2E+03		1.6E+03
				2.5E-02	I						1.4E+09		1	0.1	Fenvalerate	51630-58-1					2.0E+03	8.2E+03		1.6E+03
				1.3E-02	I						1.4E+09		1	0.1	Fluometuron	2164-17-2					1.0E+03	4.3E+03		8.2E+02
				4.0E-02	C	1.3E-02	C				1.4E+09		1		Fluoride	16984-48-8					3.1E+03		1.8E+07	3.1E+03
				6.0E-02	I	1.3E-02	C				1.4E+09		1		Fluorine (Soluble Fluoride)	7782-41-4					4.7E+03		1.8E+07	4.7E+03
				8.0E-02	I						1.4E+09		1	0.1	Fluridone	59756-60-4					6.3E+03	2.6E+04		5.1E+03
				4.0E-02	O						1.4E+09		1	0.1	Flurprimidol	56425-91-3					3.1E+03	1.3E+04		2.5E+03
				2.0E-03	O						1.4E+09		1	0.1	Flusilazole	85509-19-9					1.6E+02	6.6E+02		1.3E+02
				5.0E-01	O						1.4E+09		1	0.1	Flutolanil	66332-96-5					3.9E+04	1.6E+05		3.2E+04
				1.0E-02	I						1.4E+09		1	0.1	Fluvalinate	69409-94-5					7.8E+02	3.3E+03		6.3E+02
				9.0E-02	O						1.4E+09		1	0.1	Folpet	133-07-3					7.0E+03	3.0E+04		5.7E+03
				2.5E-03	O						1.4E+09		1	0.1	Fomesafen	72178-02-0					2.0E+02	8.2E+02		1.6E+02
				2.0E-03	I						1.4E+09		1	0.1	Fonofos	944-22-9					1.6E+02	6.6E+02		1.3E+02
2.1E-02	C	1.3E-05	I	2.0E-01	I	9.8E-03	A	V		4.2E+04	1.4E+09	7.8E+04	1		Formaldehyde	50-00-0	3.3E+03		1.7E+03	1.1E+03	1.6E+04		8.0E+02	7.6E+02
				9.0E-01	P	3.0E-04	X	V		1.1E+05	1.4E+09	9.3E+04	1		Formic Acid	64-18-6					7.0E+04		2.9E+01	2.9E+01
				2.5E+00	O						1.4E+09		1	0.1	Fosetyl-AL	39148-24-8					2.0E+05	8.2E+05		1.6E+05
															Furans									
				1.0E-03	X			V			1.4E+09	1.6E+05	1	0.03	~Dibenzofuran	132-64-9					7.8E+01	1.1E+03		7.3E+01
				1.0E-03	I			V		6.2E+03	1.4E+09	2.6E+03	1	0.03	~Furan	110-00-9					7.8E+01	1.1E+03		7.3E+01
				9.0E-01	I	2.0E+00	I	V		1.7E+05	1.4E+09	1.2E+04	1	0.03	~Tetrahydrofuran	109-99-9					7.0E+04	9.9E+05	2.5E+04	1.8E+04
3.8E+00	H										1.4E+09		1	0.1	Furazolidone	67-45-8	1.8E+01	6.5E+01		1.4E+01				
				3.0E-03	I	5.0E-02	H	V		1.0E+04	1.4E+09	4.9E+04	1		Furfural	98-01-1					2.3E+02		2.5E+03	2.1E+02
1.5E+00	C	4.3E-04	C								1.4E+09		1	0.1	Furium	531-82-8	4.6E+01	1.6E+02	8.9E+05	3.6E+01				
3.0E-02	I	8.6E-06	C								1.4E+09		1	0.1	Furmecyclox	60568-05-0	2.3E+03	8.2E+03	4.4E+07	1.8E+03				
				6.0E-03	O						1.4E+09		1	0.1	Glufosinate, Ammonium	77182-82-2					4.7E+02	2.0E+03		3.8E+02
				1.0E-01	A	8.0E-05	C				1.4E+09		1	0.1	Glutaraldehyde	111-30-8					7.8E+03	3.3E+04	1.1E+05	6.0E+03
				4.0E-04	I	1.0E-03	H	V		1.1E+05	1.4E+09	8.4E+04	1		Glycidyl	765-34-4					3.1E+01		8.8E+01	2.3E+01
				1.0E-01	I						1.4E+09		1	0.1	Glyphosate	1071-83-6					7.8E+03	3.3E+04		6.3E+03
				1.0E-02	X			V			1.4E+09	1.5E+05	1		Guanidine	113-00-8					7.8E+02			7.8E+02
				2.0E-02	P						1.4E+09		1	0.1	Guanidine Chloride	50-01-1					1.6E+03	6.6E+03		1.3E+03
				3.0E-02	X						1.4E+09		1	0.1	Guanidine Nitrate	506-93-4					2.3E+03	9.9E+03		1.9E+03
				5.0E-05	I						1.4E+09		1	0.1	Haloxyfop, Methyl	69806-40-2					3.9E+00	1.6E+01		3.2E+00
4.5E+00	I	1.3E-03	I	5.0E-04	I			V			1.4E+09	4.8E+05	1		Heptachlor	76-44-8	1.5E+01		1.0E+02	1.3E+01	3.9E+01			3.9E+01
9.1E+00	I	2.6E-03	I	1.3E-05	I			V			1.4E+09	8.4E+05	1		Heptachlor Epoxide	1024-57-3	7.6E+00		9.1E+01	7.0E+00	1.0E+00			1.0E+00
						3.0E-03	X	V		2.1E+02	1.4E+09	7.8E+03	1		Heptanal, n-	111-71-7							2.4E+01	2.4E+01
				3.0E-04	X	4.0E-01	P	V		5.8E+01	1.4E+09	9.0E+02	1		Heptane, N-	142-82-5					2.3E+01		3.7E+02	2.2E+01
				2.0E-03	I			V			1.4E+09	3.8E+05	1		Hexabromobenzene	87-82-1					1.6E+02			1.6E+02
				2.0E-04	I						1.4E+09		1	0.1	Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2					1.6E+01	6.6E+01		1.3E+01
1.6E+00	I	4.6E-04	I	8.0E-04	I			V			1.4E+09	6.8E+04	1		Hexachlorobenzene	118-74-1	4.3E+01		4.1E+01	2.1E+01	6.3E+01			6.3E+01
7.8E-02	I	2.2E-05	I	1.0E-03	P			V		1.7E+01	1.4E+09	1.1E+04	1		Hexachlorobutadiene	87-68-3	8.9E+02		1.4E+02	1.2E+02	7.8E+01			7.8E+01
6.3E+00	I	1.8E-03	I	8.0E-03	A						1.4E+09		1	0.1	Hexachlorocyclohexane, Alpha-	319-84-6	1.1E+01	3.9E+01	2.1E+05	8.6E+00	6.3E+02	2.6E+03		5.1E+02
1.8E+00	I	5.3E-04	I								1.4E+09		1	0.1	Hexachlorocyclohexane, Beta-	319-85-7	3.9E+01	1.4E+02	7.2E+05	3.0E+01				
1.1E+00	C	3.1E-04	C	3.0E-04	I						1.4E+09		1	0.04	Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	6.3E+01	5.6E+02	1.2E+06	5.7E+01	2.3E+01	2.5E+02		2.1E+01
1.8E+00	I	5.1E-04	I								1.4E+09		1	0.1	Hexachlorocyclohexane, Technical	608-73-1	3.9E+01	1.4E+02	7.5E+05	3.0E+01				

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				6.0E-03	I	2.0E-04	I	V		1.6E+01	1.4E+09	8.5E+03	1		Hexachlorocyclopentadiene	77-47-4					4.7E+02		1.8E+00	1.8E+00
4.0E-02	I	1.1E-05	C	7.0E-04	I	3.0E-02	I	V			1.4E+09	8.0E+03	1		Hexachloroethane	67-72-1	1.7E+03		2.0E+02	1.8E+02	5.5E+01		2.5E+02	4.5E+01
				3.0E-04	I						1.4E+09		1	0.1	Hexachlorophene	70-30-4					2.3E+01	9.9E+01		1.9E+01
8.0E-02	I			4.0E-03	I						1.4E+09		1	0.015	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	8.7E+02	2.1E+04		8.3E+02	3.1E+02	8.8E+03		3.0E+02
						1.0E-05	I	V		3.4E+03	1.4E+09	3.0E+05	1		Hexamethylene Diisocyanate, 1,6-	822-06-0							3.1E+00	3.1E+00
				4.0E-04	P						1.4E+09		1	0.1	Hexamethylphosphoramide	680-31-9					3.1E+01	1.3E+02		2.5E+01
						7.0E-01	I	V		1.4E+02	1.4E+09	8.3E+02	1		Hexane, N-	110-54-3							6.1E+02	6.1E+02
				2.0E+00	P						1.4E+09		1	0.1	Hexanedioic Acid	124-04-9					1.6E+05	6.6E+05		1.3E+05
9.5E-03	P			7.0E-02	P	4.0E-04	P	V			1.4E+09		1		Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7	7.3E+03			7.3E+03	5.5E+03		5.7E+05	5.4E+03
				5.0E-03	I	3.0E-02	I	V		3.3E+03	1.4E+09	1.3E+04	1		Hexanone, 2-	591-78-6					3.9E+02		4.2E+02	2.0E+02
				3.3E-02	I						1.4E+09		1	0.1	Hexazinone	51235-04-2					2.6E+03	1.1E+04		2.1E+03
				2.5E-02	I						1.4E+09		1	0.1	Hexythiazox	78587-05-0					2.0E+03	8.2E+03		1.6E+03
				1.7E-02	O						1.4E+09		1	0.1	Hydramethylnon	67485-29-4					1.3E+03	5.6E+03		1.1E+03
3.0E+00	I	4.9E-03	I			3.0E-05	P	V		1.1E+05	1.4E+09	6.5E+04	1		Hydrazine	302-01-2	2.3E+01		3.7E+00	3.2E+00			2.0E+00	2.0E+00
3.0E+00	I	4.9E-03	I								1.4E+09		1		Hydrazine Sulfate	10034-93-2	2.3E+01		7.8E+04	2.3E+01				
						2.0E-02	I	V			1.4E+09		1		Hydrogen Chloride	7647-01-0							2.8E+07	2.8E+07
				4.0E-02	C	1.4E-02	C	V			1.4E+09		1		Hydrogen Fluoride	7664-39-3					3.1E+03		2.0E+07	3.1E+03
						2.0E-03	I	V			1.4E+09		1		Hydrogen Sulfide	7783-06-4							2.8E+06	2.8E+06
6.0E-02	P			4.0E-02	P						1.4E+09		1	0.1	Hydroquinone	123-31-9	1.2E+03	4.1E+03		9.0E+02	3.1E+03	1.3E+04		2.5E+03
6.1E-02	O			2.5E-03	O						1.4E+09		1	0.1	Imazalil	35554-44-0	1.1E+03	4.0E+03		8.9E+02	2.0E+02	8.2E+02		1.6E+02
				2.5E-01	I						1.4E+09		1	0.1	Imazaquin	81335-37-7					2.0E+04	8.2E+04		1.6E+04
				2.5E+00	O						1.4E+09		1	0.1	Imazethapyr	81335-77-5					2.0E+05	8.2E+05		1.6E+05
				1.0E-02	A						1.4E+09		1		Iodine	7553-56-2					7.8E+02			7.8E+02
				4.0E-02	I						1.4E+09		1	0.1	Iprodione	36734-19-7					3.1E+03	1.3E+04		2.5E+03
				7.0E-01	P						1.4E+09		1		Iron	7439-89-6					5.5E+04			5.5E+04
				3.0E-01	I			V		1.0E+04	1.4E+09	2.8E+04	1		Isobutyl Alcohol	78-83-1					2.3E+04			2.3E+04
9.5E-04	I			2.0E-01	I	2.0E+00	C				1.4E+09		1	0.1	Isophorone	78-59-1	7.3E+04	2.6E+05		5.7E+04	1.6E+04	6.6E+04	2.8E+09	1.3E+04
				1.5E-02	I			V			1.4E+09	4.2E+05	1		Isopropalin	33820-53-0					1.2E+03			1.2E+03
				2.0E+00	P	2.0E-01	P	V		1.1E+05	1.4E+09	2.8E+04	1		Isopropanol	67-63-0					1.6E+05		5.8E+03	5.6E+03
				1.0E-01	I						1.4E+09		1	0.1	Isopropyl Methyl Phosphonic Acid	1832-54-8					7.8E+03	3.3E+04		6.3E+03
				5.0E-02	I						1.4E+09		1	0.1	Isoxaben	82558-50-7					3.9E+03	1.6E+04		3.2E+03
						3.0E-01	A	V			1.4E+09		1		JP-7	E1737665							4.3E+08	4.3E+08
				8.0E-03	O						1.4E+09		1	0.1	Lactofen	77501-63-4					6.3E+02	2.6E+03		5.1E+02
				2.0E-04	X						1.4E+09		1	0.1	Lactonitrile	78-97-7					1.6E+01	6.6E+01		1.3E+01
				5.0E-05	P						1.4E+09		1		Lanthanum	7439-91-0					3.9E+00			3.9E+00
				2.1E-05	P						1.4E+09		1	0.1	Lanthanum Acetate Hydrate	100587-90-4					1.6E+00	6.9E+00		1.3E+00
				1.9E-05	P						1.4E+09		1		Lanthanum Chloride Heptahydrate	10025-84-0					1.5E+00			1.5E+00
				2.8E-05	P						1.4E+09		1		Lanthanum Chloride, Anhydrous	10099-58-8					2.2E+00			2.2E+00
				1.6E-05	P						1.4E+09		1		Lanthanum Nitrate Hexahydrate	10277-43-7					1.3E+00			1.3E+00
															Lead Compounds									
8.5E-03	C	1.2E-05	C								1.4E+09		1		~Lead Phosphate	7446-27-7	8.2E+03		3.2E+07	8.2E+03				
8.5E-03	C	1.2E-05	C								1.4E+09		1	0.1	~Lead acetate	301-04-2	8.2E+03	2.9E+04	3.2E+07	6.4E+03				
											1.4E+09		1		~Lead and Compounds	7439-92-1								4.0E+02
8.5E-03	C	1.2E-05	C								1.4E+09		1	0.1	~Lead subacetate	1335-32-6	8.2E+03	2.9E+04	3.2E+07	6.4E+03				
				1.0E-07	I			V		2.4E+00	1.4E+09	1.9E+03	1		~Tetraethyl Lead	78-00-2					7.8E-03			7.8E-03
				5.0E-06	P			V		3.8E+02	1.4E+09	2.6E+04	1		Lewisite	541-25-3					3.9E-01			3.9E-01
				7.7E-03	O						1.4E+09		1	0.1	Linuron	330-55-2					6.0E+02	2.5E+03		4.9E+02
				2.0E-03	P						1.4E+09		1		Lithium	7439-93-2					1.6E+02			1.6E+02
				5.0E-04	I						1.4E+09		1	0.1	MCPA	94-74-6					3.9E+01	1.6E+02		3.2E+01
				4.4E-03	O						1.4E+09		1	0.1	MCPB	94-81-5					3.4E+02	1.5E+03		2.8E+02
				1.0E-03	I						1.4E+09		1	0.1	MCPP	93-65-2					7.8E+01	3.3E+02		6.3E+01
				2.0E-02	I						1.4E+09		1	0.1	Malathion	121-75-5					1.6E+03	6.6E+03		1.3E+03
				1.0E-01	I	7.0E-04	C				1.4E+09		1	0.1	Maleic Anhydride	108-31-6					7.8E+03	3.3E+04	9.9E+05	6.3E+03
				5.0E-01	I						1.4E+09		1	0.1	Maleic Hydrazide	123-33-1					3.9E+04	1.6E+05		3.2E+04
				1.0E-04	P						1.4E+09		1	0.1	Malononitrile	109-77-3					7.8E+00	3.3E+01		6.3E+00
				3.0E-02	H						1.4E+09		1	0.1	Mancozeb	8018-01-7					2.3E+03	9.9E+03		1.9E+03
				5.0E-03	I						1.4E+09		1	0.1	Maneb	12427-38-2					3.9E+02	1.6E+03		3.2E+02
				1.4E-01	I	5.0E-05	I						1		Manganese (Diet)	7439-96-5								
				2.4E-02	G	5.0E-05	I				1.4E+09		0.04		Manganese (Non-diet)	7439-96-5					1.9E+03		7.1E+04	1.8E+03
				9.0E-05	H						1.4E+09		1	0.1	Mephosfolan	950-10-7					7.0E+00	3.0E+01		5.7E+00
				3.0E-02	I						1.4E+09		1	0.1	Mepiquat Chloride	24307-26-4					2.3E+03	9.9E+03		1.9E+03
1.1E-02	P			4.0E-03	P						1.4E+09		1	0.1	Mercaptobenzothiazole, 2-	149-30-4	6.3E+03	2.2E+04		4.9E+03	3.1E+02	1.3E+03		2.5E+02
															Mercury Compounds									
				3.0E-04	I	3.0E-04	G				1.4E+09		0.07		~Mercuric Chloride (and other Mercury salts)	7487-94-7					2.3E+01		4.3E+05	2.3E+01
						3.0E-04	I	V		3.1E+00	1.4E+09	3.5E+04	1		~Mercury (elemental)	7439-97-6							1.1E+01	1.1E+01
				1.0E-04	I						1.4E+09		1		~Methyl Mercury	22967-92-6					7.8E+00			7.8E+00
				8.0E-05	I						1.4E+09		1	0.1	~Phenylmercuric Acetate	62-38-4					6.3E+00	2.6E+01		5.1E+00
				3.0E-05	I			V			1.4E+09	1.9E+06	1		Merphos	150-50-5					2.3E+00			2.3E+00
				1.0E-04	O						1.4E+09		1	0.1	Merphos Oxide	78-48-8					7.8E+00	3.3E+01		6.3E+00
				6.0E-02	I						1.4E+09		1	0.1	Metalaxyl	57837-19-1					4.7E+03	2.0E+04		3.8E+03
				1.0E-04	I	3.0E-02	P	V		4.6E+03	1.4E+09	6.8E+03	1		Methacrylonitrile	126-98-7					7.8E+00		2.1E+02	7.5E+00
				5.0E-05	I						1.4E+09		1	0.1	Methamidophos	10265-92-6					3.9E+00	1.6E+01		3.2E+00
				2.0E+00	I	2.0E+01	I	V		1.1E+05	1.4E+09	2.9E+04	1		Methanol	67-56-1					1.6E+05		6.1E+05	1.2E+05
				1.5E-03	O						1.4E+09		1	0.1	Methidathion	950-37-8					1.2E+02	4.9E+02		9.5E+01

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c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				2.5E-02	I						1.4E+09		1	0.1	Methomyl	16752-77-5					2.0E+03	8.2E+03		1.6E+03
4.9E-02	C	1.4E-05	C								1.4E+09		1	0.1	Methoxy-5-nitroaniline, 2-	99-59-2	1.4E+03	5.0E+03	2.7E+07	1.1E+03				
				5.0E-03	I						1.4E+09		1	0.1	Methoxychlor	72-43-5					3.9E+02	1.6E+03		3.2E+02
				8.0E-03	P	1.0E-03	P	V		1.2E+05	1.4E+09	1.2E+05	1		Methoxyethanol Acetate, 2-	110-49-6					6.3E+02		1.3E+02	1.1E+02
				5.0E-03	P	2.0E-02	I	V		1.1E+05	1.4E+09	1.0E+05	1		Methoxyethanol, 2-	109-86-4					3.9E+02		2.1E+03	3.3E+02
				1.0E+00	X			V		2.9E+04	1.4E+09	8.1E+03	1		Methyl Acetate	79-20-9					7.8E+04			7.8E+04
						2.0E-02	P	V		6.8E+03	1.4E+09	7.0E+03	1		Methyl Acrylate	96-33-3							1.5E+02	1.5E+02
				6.0E-01	I	5.0E+00	I	V		2.8E+04	1.4E+09	1.2E+04	1		Methyl Ethyl Ketone (2-Butanone)	78-93-3					4.7E+04		6.4E+04	2.7E+04
		1.0E-03	X	1.0E-03	P	2.0E-05	X	V		1.8E+05	1.4E+09	5.0E+04	1		Methyl Hydrazine	60-34-4			1.4E+01	1.4E+01	7.8E+01		1.1E+00	1.0E+00
						3.0E+00	I	V		3.4E+03	1.4E+09	1.1E+04	1		Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1							3.3E+04	3.3E+04
						1.0E-03	C	V		1.0E+04	1.4E+09	4.4E+03	1		Methyl Isocyanate	624-83-9							4.6E+00	4.6E+00
				1.4E+00	I	7.0E-01	I	V		2.4E+03	1.4E+09	6.3E+03	1		Methyl Methacrylate	80-62-6					1.1E+05		4.6E+03	4.4E+03
				2.5E-04	I						1.4E+09		1	0.1	Methyl Parathion	298-00-0					2.0E+01	8.2E+01		1.6E+01
				6.0E-02	X						1.4E+09		1	0.1	Methyl Phosphonic Acid	993-13-5					4.7E+03	2.0E+04		3.8E+03
				6.0E-03	H	4.0E-02	H	V		3.9E+02	1.4E+09	2.4E+04	1		Methyl Styrene (Mixed Isomers)	25013-15-4					4.7E+02		1.0E+03	3.2E+02
9.9E-02	C	2.8E-05	C								1.4E+09		1	0.1	Methyl methanesulfonate	66-27-3	7.0E+02	2.5E+03	1.4E+07	5.5E+02				
1.8E-03	C	2.6E-07	C			3.0E+00	I	V		8.9E+03	1.4E+09	4.9E+03	1		Methyl tert-Butyl Ether (MTBE)	1634-04-4	3.9E+04		5.3E+03	4.7E+03			1.5E+04	1.5E+04
				3.0E-04	X						1.4E+09		1	0.1	Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2					2.3E+01	9.9E+01		1.9E+01
						3.0E+00	X	V		2.5E+03	1.4E+09	1.7E+04	1		Methyl-2-Pentanol, 4-	108-11-2							5.4E+04	5.4E+04
9.0E-03	P			2.0E-02	X						1.4E+09		1	0.1	Methyl-5-Nitroaniline, 2-	99-55-8	7.7E+03	2.7E+04		6.0E+03	1.6E+03	6.6E+03		1.3E+03
8.3E+00	C	2.4E-03	C								1.4E+09		1	0.1	Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	8.4E+00	3.0E+01	1.6E+05	6.5E+00				
1.3E-01	C	3.7E-05	C								1.4E+09		1	0.1	Methylaniline Hydrochloride, 2-	636-21-5	5.3E+02	1.9E+03	1.0E+07	4.2E+02				
				1.0E-02	A						1.4E+09		1	0.1	Methylarsonic acid	124-58-3					7.8E+02	3.3E+03		6.3E+02
				2.0E-04	X						1.4E+09		1	0.1	Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7					1.6E+01	6.6E+01		1.3E+01
1.0E-01	X			3.0E-04	X						1.4E+09		1	0.1	Methylbenzene-1,4-diamine sulfate, 2-	615-50-9	7.0E+02	2.5E+03		5.4E+02	2.3E+01	9.9E+01		1.9E+01
2.2E+01	C	6.3E-03	C						M		1.4E+09		1	0.1	Methylcholanthrene, 3-	56-49-5	7.0E-01	2.7E+00	2.2E+04	5.5E-01				
2.0E-03	I	1.0E-08	I	6.0E-03	I	6.0E-01	I	V	M	3.3E+03	1.4E+09	2.2E+03	1		Methylene Chloride	75-09-2	7.7E+03		2.2E+04	5.7E+03	4.7E+02		1.4E+03	3.5E+02
1.0E-01	P	4.3E-04	C	2.0E-03	P				M		1.4E+09		1	0.1	Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.5E+02	6.0E+02	3.2E+05	1.2E+02	1.6E+02	6.6E+02		1.3E+02
4.6E-02	I	1.3E-05	C								1.4E+09		1	0.1	Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.5E+03	5.4E+03	2.9E+07	1.2E+03				
1.6E+00	C	4.6E-04	C			2.0E-02	C				1.4E+09		1	0.1	Methylenebisbenzenamine, 4,4'-	101-77-9	4.3E+01	1.5E+02	8.3E+05	3.4E+01			2.8E+07	2.8E+07
						6.0E-04	I				1.4E+09		1	0.1	Methylenediphenyl Diisocyanate	101-68-8							8.5E+05	8.5E+05
				7.0E-02	H			V		5.0E+02	1.4E+09	1.3E+04	1		Methylstyrene, Alpha-	98-83-9					5.5E+03			5.5E+03
				1.5E-01	I						1.4E+09		1	0.1	Metolachlor	51218-45-2					1.2E+04	4.9E+04		9.5E+03
				2.5E-02	I						1.4E+09		1	0.1	Metribuzin	21087-64-9					2.0E+03	8.2E+03		1.6E+03
				2.5E-01	I						1.4E+09		1	0.1	Metsulfuron-methyl	74223-64-6					2.0E+04	8.2E+04		1.6E+04
				3.0E+00	P			V		3.4E-01	1.4E+09	1.4E+03	1		Mineral oils	8012-95-1					2.3E+05			2.3E+05
1.8E+01	C	5.1E-03	C	2.0E-04	I			V			1.4E+09	8.6E+05	1		Mirex	2385-85-5	3.9E+00		4.7E+01	3.6E+00	1.6E+01			1.6E+01
				2.0E-03	I						1.4E+09		1	0.1	Molinate	2212-67-1					1.6E+02	6.6E+02		1.3E+02
				5.0E-03	I						1.4E+09		1		Molybdenum	7439-98-7					3.9E+02			3.9E+02
				1.0E-01	I						1.4E+09		1		Monochloramine	10599-90-3					7.8E+03			7.8E+03
				2.0E-03	P						1.4E+09		1	0.1	Monomethylaniline	100-61-8					1.6E+02	6.6E+02		1.3E+02
				2.5E-02	I						1.4E+09		1	0.1	Myclobutanil	88671-89-0					2.0E+03	8.2E+03		1.6E+03
				3.0E-04	X						1.4E+09		1	0.1	N,N'-Diphenyl-1,4-benzenediamine	74-31-7					2.3E+01	9.9E+01		1.9E+01
				2.0E-03	I			V			1.4E+09	5.7E+04	1		Naled	300-76-5					1.6E+02			1.6E+02
				3.0E-02	X	1.0E-01	P	V			1.4E+09		1		Naphtha, High Flash Aromatic (HFAN)	64742-95-6					2.3E+03		1.4E+08	2.3E+03
1.8E+00	C	0.0E+00	C								1.4E+09		1	0.1	Naphthylamine, 2-	91-59-8	3.9E+01	1.4E+02		3.0E+01				
				1.2E-01	O						1.4E+09		1	0.1	Napropamide	15299-99-7					9.4E+03	4.0E+04		7.6E+03
		2.6E-04	C	1.1E-02	C	1.4E-05	C				1.4E+09		1	0.1	Nickel Acetate	373-02-4			1.5E+06	1.5E+06	8.6E+02	3.6E+03	2.0E+04	6.7E+02
		2.6E-04	C	1.1E-02	C	1.4E-05	C				1.4E+09		1	0.1	Nickel Carbonate	3333-67-3			1.5E+06	1.5E+06	8.6E+02	3.6E+03	2.0E+04	6.7E+02
		2.6E-04	C	1.1E-02	C	1.4E-05	C	V			1.4E+09		1		Nickel Carbonyl	13463-39-3			1.5E+06	1.5E+06	8.6E+02		2.0E+04	8.2E+02
		2.6E-04	C	1.1E-02	C	1.4E-05	C				1.4E+09		0.04		Nickel Hydroxide	12054-48-7			1.5E+06	1.5E+06	8.6E+02		2.0E+04	8.2E+02
		2.6E-04	C	1.1E-02	C	2.0E-05	C				1.4E+09		0.04		Nickel Oxide	1313-99-1			1.5E+06	1.5E+06	8.6E+02		2.8E+04	8.4E+02
		2.4E-04	I	1.1E-02	C	1.4E-05	C				1.4E+09		0.04		Nickel Refinery Dust	E715532			1.6E+06	1.6E+06	8.6E+02		2.0E+04	8.2E+02
		2.6E-04	C	2.0E-02	I	9.0E-05	A				1.4E+09		0.04		Nickel Soluble Salts	7440-02-0			1.5E+06	1.5E+06	1.6E+03		1.3E+05	1.5E+03
1.7E+00	C	4.8E-04	I	1.1E-02	C	1.4E-05	C				1.4E+09		0.04		Nickel Subsulfide	12035-72-2	4.1E+01		8.0E+05	4.1E+01	8.6E+02		2.0E+04	8.2E+02
		2.6E-04	C	1.1E-02	C	1.4E-05	C				1.4E+09		1	0.1	Nickelocene	1271-28-9			1.5E+06	1.5E+06	8.6E+02	3.6E+03	2.0E+04	6.7E+02
				1.6E+00	I						1.4E+09		1		Nitrate (measured as nitrogen)	14797-55-8					1.3E+05			1.3E+05
											1.4E+09		1		Nitrate + Nitrite (measured as nitrogen)	E701177								
				1.0E-01	I						1.4E+09		1		Nitrite (measured as nitrogen)	14797-65-0					7.8E+03			7.8E+03
				1.0E-02	X	5.0E-05	X				1.4E+09		1	0.1	Nitroaniline, 2-	88-74-4					7.8E+02	3.3E+03	7.1E+04	6.3E+02
2.0E-02	P			4.0E-03	P	6.0E-03	P				1.4E+09		1	0.1	Nitroaniline, 4-	100-01-6	3.5E+03	1.2E+04		2.7E+03	3.1E+02	1.3E+03	8.5E+06	2.5E+02
		4.0E-05	I	2.0E-03	I	9.0E-03	I	V		3.1E+03	1.4E+09	7.3E+04	1		Nitrobenzene	98-95-3			5.1E+02	5.1E+02	1.6E+02		6.9E+02	1.3E+02
				3.0E+03	P						1.4E+09		1	0.1	Nitrocellulose	9004-70-0					2.3E+08	9.9E+08		1.9E+08
				7.0E-02	H						1.4E+09		1	0.1	Nitrofurantoin	67-20-9					5.5E+03	2.3E+04		4.4E+03
1.3E+00	C	3.7E-04	C								1.4E+09		1	0.1	Nitrofurazone	59-87-0	5.3E+01	1.9E+02	1.0E+06	4.2E+01				
1.7E-02	P			1.0E-04	P						1.4E+09		1	0.1	Nitroglycerin	55-63-0	4.1E+03	1.5E+04		3.2E+03	7.8E+00	3.3E+01		6.3E+00
				1.0E-01	I						1.4E+09		1	0.1	Nitroguanidine	556-88-7					7.8E+03	3.3E+04		6.3E+03
		8.8E-06	P			5.0E-03	P	V		1.8E+04	1.4E+09	1.7E+04	1		Nitromethane	75-52-5			5.4E+02	5.4E+02			8.8E+01	8.8E+01
		2.7E-03	H			2.0E-02	I	V		4.9E+03	1.4E+09	1.3E+04	1		Nitropropane, 2-	79-46-9			1.4E+00	1.4E+00			2.7E+02	2.7E+02
2.7E+01	C	7.7E-03	C						M		1.4E+09		1	0.1	Nitroso-N-ethylurea, N-	759-73-9	5.7E-01	2.2E+00	1.8E+04	4.5E-01				
1.2E+02	C	3.4E-02	C						M		1.4E+09		1	0.1	Nitroso-N-methylurea, N-	684-93-5	1.3E-01	5.0E-01	4.1E+03	1.0E-01				
5.4E+00	I	1.6E-03	I					V			1.4E+09	2.4E+05	1		Nitroso-di-N-butylamine, N-	924-16-3	1.3E+01		4.3E+01	9.9E+00				
7.0E+00	I	2.0E-03	C								1.4E+09		1	0.1	Nitroso-di-N-propylamine, N-	621-64-7	9.9E+00	3.5E+01	1.9E+05	7.8E+00				
2.8E+00	I	8.0E-04	C								1.4E+09		1	0.1	Nitrosodiethanolamine, N-	1116-54-7	2.5E+01	8.8E+01	4.8E+05	1.9E+01				

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
1.5E+02	I	4.3E-02	I						M		1.4E+09		1	0.1	Nitrosodiethylamine, N-	55-18-5	1.0E-01	4.0E-01	3.2E+03	8.1E-02				
5.1E+01	I	1.4E-02	I	8.0E-06	P	4.0E-05	X	V	M	2.4E+05	1.4E+09	8.2E+04	1		Nitrosodimethylamine, N-	62-75-9	3.0E-01		6.0E-01	2.0E-01	6.3E-01		3.4E+00	5.3E-01
4.9E-03	I	2.6E-06	C								1.4E+09		1	0.1	Nitrosodiphenylamine, N-	86-30-6	1.4E+04	5.0E+04	1.5E+08	1.1E+04				
2.2E+01	I	6.3E-03	C					V		1.1E+05	1.4E+09	1.2E+05	1		Nitrosomethylethylamine, N-	10595-95-6	3.2E+00		5.4E+00	2.0E+00				
6.7E+00	C	1.9E-03	C								1.4E+09		1	0.1	Nitrosomorpholine [N-]	59-89-2	1.0E+01	3.7E+01	2.0E+05	8.1E+00				
9.4E+00	C	2.7E-03	C								1.4E+09		1	0.1	Nitrosopiperidine [N-]	100-75-4	7.4E+00	2.6E+01	1.4E+05	5.8E+00				
2.1E+00	I	6.1E-04	I								1.4E+09		1	0.1	Nitrosopyrrolidine, N-	930-55-2	3.3E+01	1.2E+02	6.3E+05	2.6E+01				
				1.0E-04	X						1.4E+09		1	0.1	Nitrotoluene, m-	99-08-1					7.8E+00	3.3E+01		6.3E+00
2.2E-01	P			9.0E-04	P			V		1.5E+03	1.4E+09	1.4E+05	1		Nitrotoluene, o-	88-72-2	3.2E+02			3.2E+02	7.0E+01			7.0E+01
1.6E-02	P			4.0E-03	P						1.4E+09		1	0.1	Nitrotoluene, p-	99-99-0	4.3E+03	1.5E+04		3.4E+03	3.1E+02	1.3E+03		2.5E+02
				3.0E-04	X	2.0E-02	P	V		6.9E+00	1.4E+09	1.0E+03	1		Nonane, n-	111-84-2					2.3E+01		2.2E+01	1.1E+01
				1.5E-02	O						1.4E+09		1	0.1	Norflurazon	27314-13-2					1.2E+03	4.9E+03		9.5E+02
				3.0E-03	I						1.4E+09		1	0.1	Octabromodiphenyl Ether	32536-52-0					2.3E+02	9.9E+02		1.9E+02
				5.0E-02	I						1.4E+09		1	0.006	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0					3.9E+03	2.7E+05		3.9E+03
				2.0E-03	H						1.4E+09		1	0.1	Octamethylpyrophosphoramide	152-16-9					1.6E+02	6.6E+02		1.3E+02
7.8E-03	O			1.4E-01	O						1.4E+09		1	0.1	Oryzalin	19044-88-3	8.9E+03	3.2E+04		7.0E+03	1.1E+04	4.6E+04		8.8E+03
				5.0E-03	I						1.4E+09		1	0.1	Oxadiazon	19666-30-9					3.9E+02	1.6E+03		3.2E+02
				2.5E-02	I						1.4E+09		1	0.1	Oxamyl	23135-22-0					2.0E+03	8.2E+03		1.6E+03
7.3E-02	O			3.0E-02	O						1.4E+09		1	0.1	Oxyfluorfen	42874-03-3	9.5E+02	3.4E+03		7.4E+02	2.3E+03	9.9E+03		1.9E+03
				1.3E-02	I						1.4E+09		1	0.1	Paclobutrazol	76738-62-0					1.0E+03	4.3E+03		8.2E+02
				4.5E-03	I						1.4E+09		1	0.1	Paraquat Dichloride	1910-42-5					3.5E+02	1.5E+03		2.8E+02
				6.0E-03	H						1.4E+09		1	0.1	Parathion	56-38-2					4.7E+02	2.0E+03		3.8E+02
				5.0E-02	H			V			1.4E+09	4.5E+04	1		Pebulate	1114-71-2					3.9E+03			3.9E+03
				3.0E-01	O						1.4E+09		1	0.1	Pendimethalin	40487-42-1					2.3E+04	9.9E+04		1.9E+04
				2.0E-03	I			V		3.1E-01	1.4E+09	5.1E+05	1		Pentabromodiphenyl Ether	32534-81-9					1.6E+02			1.6E+02
				1.0E-04	I						1.4E+09		1	0.1	Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9					7.8E+00	3.3E+01		6.3E+00
				8.0E-04	I			V			1.4E+09	8.1E+04	1		Pentachlorobenzene	608-93-5					6.3E+01			6.3E+01
9.0E-02	P							V		4.6E+02	1.4E+09	9.7E+03	1		Pentachloroethane	76-01-7	7.7E+02			7.7E+02				
2.6E-01	H			3.0E-03	I			V			1.4E+09	4.3E+05	1		Pentachloronitrobenzene	82-68-8	2.7E+02			2.7E+02	2.3E+02			2.3E+02
4.0E-01	I	5.1E-06	C	5.0E-03	I						1.4E+09		1	0.25	Pentachlorophenol	87-86-5	1.7E+02	2.5E+02	7.5E+07	1.0E+02	3.9E+02	6.6E+02		2.5E+02
4.0E-03	X			2.0E-03	P						1.4E+09		1	0.1	Pentaerythritol tetranitrate (PETN)	78-11-5	1.7E+04	6.2E+04		1.4E+04	1.6E+02	6.6E+02		1.3E+02
						1.0E+00	P	V		3.9E+02	1.4E+09	7.8E+02	1		Pentane, n-	109-66-0							8.1E+02	8.1E+02
															Perchlorates									
				7.0E-04	I						1.4E+09		1		~Ammonium Perchlorate	7790-98-9					5.5E+01			5.5E+01
				7.0E-04	I						1.4E+09		1		~Lithium Perchlorate	7791-03-9					5.5E+01			5.5E+01
				7.0E-04	I						1.4E+09		1		~Perchlorate and Perchlorate Salts	14797-73-0					5.5E+01			5.5E+01
				7.0E-04	I						1.4E+09		1		~Potassium Perchlorate	7778-74-7					5.5E+01			5.5E+01
				7.0E-04	I						1.4E+09		1		~Sodium Perchlorate	7601-89-0					5.5E+01			5.5E+01
				2.0E-02	P						1.4E+09		1	0.1	Perfluorobutane sulfonic acid (PFBS)	375-73-5					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	P						1.4E+09		1	0.1	Perfluorobutanesulfonate	45187-15-3					1.6E+03	6.6E+03		1.3E+03
				5.0E-02	I						1.4E+09		1	0.1	Permethrin	52645-53-1					3.9E+03	1.6E+04		3.2E+03
2.2E-03	C	6.3E-07	C								1.4E+09		1	0.1	Phenacetin	62-44-2	3.2E+04	1.1E+05	6.1E+08	2.5E+04				
				2.4E-01	O						1.4E+09		1	0.1	Phenmedipham	13684-63-4					1.9E+04	7.9E+04		1.5E+04
				3.0E-01	I	2.0E-01	C				1.4E+09		1	0.1	Phenol	108-95-2					2.3E+04	9.9E+04	2.8E+08	1.9E+04
				4.0E-03	I						1.4E+09		1	0.1	Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1					3.1E+02	1.3E+03		2.5E+02
				5.0E-04	X						1.4E+09		1	0.1	Phenothiazine	92-84-2					3.9E+01	1.6E+02		3.2E+01
				2.0E-04	X			V		1.3E+02	1.4E+09	7.1E+03	1		Phenyl Isothiocyanate	103-72-0					1.6E+01			1.6E+01
				6.0E-03	I						1.4E+09		1	0.1	Phenylenediamine, m-	108-45-2					4.7E+02	2.0E+03		3.8E+02
1.2E-01	P			4.0E-03	P						1.4E+09		1	0.1	Phenylenediamine, o-	95-54-5	5.8E+02	2.1E+03		4.5E+02	3.1E+02	1.3E+03		2.5E+02
				1.0E-03	X						1.4E+09		1	0.1	Phenylenediamine, p-	106-50-3					7.8E+01	3.3E+02		6.3E+01
1.9E-03	H										1.4E+09		1	0.1	Phenylphenol, 2-	90-43-7	3.6E+04	1.3E+05		2.8E+04				
				2.0E-04	H						1.4E+09		1	0.1	Phorate	298-02-2					1.6E+01	6.6E+01		1.3E+01
						3.0E-04	I	V		1.6E+03	1.4E+09	9.8E+02	1		Phosgene	75-44-5							3.1E-01	3.1E-01
				2.0E-02	I						1.4E+09		1	0.1	Phosmet	732-11-6					1.6E+03	6.6E+03		1.3E+03
															Phosphates, Inorganic									
				4.9E+01	P						1.4E+09		1		~Aluminum metaphosphate	13776-88-0					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Ammonium polyphosphate	68333-79-9					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Calcium pyrophosphate	7790-76-3					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Diammonium phosphate	7783-28-0					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Dicalcium phosphate	7757-93-9					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Dimagnesium phosphate	7782-75-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Dipotassium phosphate	7758-11-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Disodium phosphate	7558-79-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monoaluminum phosphate	13530-50-2					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monoammonium phosphate	7722-76-1					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monocalcium phosphate	7758-23-8					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monomagnesium phosphate	7757-86-0					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monopotassium phosphate	7778-77-0					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Monosodium phosphate	7558-80-7					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Polyphosphoric acid	8017-16-1					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Potassium tripolyphosphate	13845-36-8					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium acid pyrophosphate	7758-16-9					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium aluminum phosphate (acidic)	7785-88-8					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium aluminum phosphate (anhydrous)	10279-59-1					3.8E+06			3.8E+06

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				4.9E+01	P						1.4E+09		1		~Sodium aluminum phosphate (tetrahydrate)	10305-76-7					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium hexametaphosphate	10124-56-8					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium polyphosphate	68915-31-1					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium trimetaphosphate	7785-84-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Sodium tripolyphosphate	7758-29-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Tetrapotassium phosphate	7320-34-5					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Tetrasodium pyrophosphate	7722-88-5					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Tricalcium phosphate	7758-87-4					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Trimagnesium phosphate	7757-87-1					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Tripotassium phosphate	7778-53-2					3.8E+06			3.8E+06
				4.9E+01	P						1.4E+09		1		~Trisodium phosphate	7601-54-9					3.8E+06			3.8E+06
				3.0E-04	I	3.0E-04	I	V			1.4E+09		1		Phosphine	7803-51-2					2.3E+01		4.3E+05	2.3E+01
				4.9E+01	P	1.0E-02	I				1.4E+09		1		Phosphoric Acid	7664-38-2					3.8E+06		1.4E+07	3.0E+06
				2.0E-05	I			V			1.4E+09	6.9E+03	1		Phosphorus, White	7723-14-0					1.6E+00			1.6E+00
															Phthalates									
1.4E-02	I	2.4E-06	C	2.0E-02	I						1.4E+09		1	0.1	~Bis(2-ethylhexyl)phthalate	117-81-7	5.0E+03	1.8E+04	1.6E+08	3.9E+03	1.6E+03	6.6E+03		1.3E+03
1.9E-03	P			2.0E-01	I						1.4E+09		1	0.1	~Butyl Benzyl Phthalate	85-68-7	3.7E+04	1.3E+05		2.9E+04	1.6E+04	6.6E+04		1.3E+04
				1.0E+00	I						1.4E+09		1	0.1	~Butylphthalyl Butylglycolate	85-70-1					7.8E+04	3.3E+05		6.3E+04
				1.0E-01	I						1.4E+09		1	0.1	~Dibutyl Phthalate	84-74-2					7.8E+03	3.3E+04		6.3E+03
				8.0E-01	I						1.4E+09		1	0.1	~Diethyl Phthalate	84-66-2					6.3E+04	2.6E+05		5.1E+04
				1.0E-01	I			V			1.4E+09	2.1E+04	1		~Dimethylterephthalate	120-61-6					7.8E+03			7.8E+03
				1.0E-02	P						1.4E+09		1	0.1	~Octyl Phthalate, di-N-	117-84-0					7.8E+02	3.3E+03		6.3E+02
				1.0E+00	H						1.4E+09		1	0.1	~Phthalic Acid, P-	100-21-0					7.8E+04	3.3E+05		6.3E+04
				2.0E+00	I	2.0E-02	C				1.4E+09		1	0.1	~Phthalic Anhydride	85-44-9					1.6E+05	6.6E+05	2.8E+07	1.3E+05
				7.0E-02	I						1.4E+09		1	0.1	Picloram	1918-02-1					5.5E+03	2.3E+04		4.4E+03
				1.0E-04	X						1.4E+09		1	0.1	Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3					7.8E+00	3.3E+01		6.3E+00
				9.0E-04	X						1.4E+09		1	0.1	Picric Acid (2,4,6-Trinitrophenol)	88-89-1					7.0E+01	3.0E+02		5.7E+01
				7.0E-05	O						1.4E+09		1	0.1	Pirimiphos, Methyl	29232-93-7					5.5E+00	2.3E+01		4.4E+00
3.0E+01	C	8.6E-03	C	7.0E-06	H						1.4E+09		1	0.1	Polybrominated Biphenyls	59536-65-1	2.3E+00	8.2E+00	4.4E+04	1.8E+00	5.5E-01	2.3E+00		4.4E-01
															Polychlorinated Biphenyls (PCBs)									
7.0E-02	G	2.0E-05	G	7.0E-05	I			V			1.4E+09	7.1E+05	1	0.14	~Aroclor 1016	12674-11-2	9.9E+02	2.5E+03	1.0E+04	6.7E+02	5.5E+00	1.6E+01		4.1E+00
2.0E+00	G	5.7E-04	G					V			1.4E+09	2.0E+05	1	0.14	~Aroclor 1221	11104-28-2	3.5E+01	8.8E+01	1.0E+02	2.0E+01				
2.0E+00	G	5.7E-04	G					V			1.4E+09	1.1E+05	1	0.14	~Aroclor 1232	11141-16-5	3.5E+01	8.8E+01	5.5E+01	1.7E+01				
2.0E+00	G	5.7E-04	G					V			1.4E+09	5.9E+05	1	0.14	~Aroclor 1242	53469-21-9	3.5E+01	8.8E+01	2.9E+02	2.3E+01				
2.0E+00	G	5.7E-04	G					V			1.4E+09	6.3E+05	1	0.14	~Aroclor 1248	12672-29-6	3.5E+01	8.8E+01	3.1E+02	2.3E+01				
2.0E+00	G	5.7E-04	G	2.0E-05	I			V			1.4E+09	8.4E+05	1	0.14	~Aroclor 1254	11097-69-1	3.5E+01	8.8E+01	4.1E+02	2.4E+01	1.6E+00	4.7E+00		1.2E+00
2.0E+00	G	5.7E-04	G					V			1.4E+09	1.3E+06	1	0.14	~Aroclor 1260	11096-82-5	3.5E+01	8.8E+01	6.5E+02	2.4E+01				
				6.0E-04	X			V			1.4E+09	9.8E+05	1	0.14	~Aroclor 5460	11126-42-4					4.7E+01	1.4E+02		3.5E+01
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	2.4E+06	1	0.14	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.8E+01	4.5E+01	6.0E+02	1.3E+01	1.8E+00	5.5E+00	3.4E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	1.6E+06	1	0.14	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.8E+01	4.5E+01	3.9E+02	1.2E+01	1.8E+00	5.5E+00	2.2E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	1.0E+06	1	0.14	~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.8E+01	4.5E+01	2.6E+02	1.2E+01	1.8E+00	5.5E+00	1.4E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	1.1E+06	1	0.14	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.8E+01	4.5E+01	2.7E+02	1.2E+01	1.8E+00	5.5E+00	1.5E+03	1.4E+00
3.9E+03	W	1.1E+00	W	2.3E-08	W	1.3E-06	W	V			1.4E+09	1.6E+06	1	0.14	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.8E-02	4.5E-02	3.9E-01	1.2E-02	1.8E-03	5.5E-03	2.2E+00	1.4E-03
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	7.3E+05	1	0.14	~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.8E+01	4.5E+01	1.8E+02	1.2E+01	1.8E+00	5.5E+00	1.0E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	5.9E+05	1	0.14	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.8E+01	4.5E+01	1.5E+02	1.2E+01	1.8E+00	5.5E+00	8.2E+02	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	6.0E+05	1	0.14	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.8E+01	4.5E+01	1.5E+02	1.2E+01	1.8E+00	5.5E+00	8.4E+02	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.4E+09	1.1E+06	1	0.14	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.8E+01	4.5E+01	2.6E+02	1.2E+01	1.8E+00	5.5E+00	1.5E+03	1.4E+00
1.3E+04	W	3.8E+00	W	7.0E-09	W	4.0E-07	W	V			1.4E+09	7.3E+05	1	0.14	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	5.3E-03	1.4E-02	5.4E-02	3.6E-03	5.5E-04	1.6E-03	3.0E-01	4.1E-04
2.0E+00	I	5.7E-04	I					V			1.4E+09	5.3E+05	1	0.14	~Polychlorinated Biphenyls (high risk)	1336-36-3	3.5E+01	8.8E+01	2.6E+02	2.3E+01				
4.0E-01	I	1.0E-04	I					V					1	0.14	~Polychlorinated Biphenyls (low risk)	1336-36-3								
7.0E-02	I	2.0E-05	I					V					1	0.14	~Polychlorinated Biphenyls (lowest risk)	1336-36-3								
1.3E+01	W	3.8E-03	W	7.0E-06	W	4.0E-04	W				1.4E+09		1	0.14	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	5.3E+00	1.4E+01	1.0E+05	3.8E+00	5.5E-01	1.6E+00	5.7E+05	4.1E-01
3.9E+01	W	1.1E-02	W	2.3E-06	W	1.3E-04	W	V			1.4E+09	5.1E+05	1	0.14	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.8E+00	4.5E+00	1.3E+01	1.2E+00	1.8E-01	5.5E-01	7.1E+01	1.4E-01
						6.0E-04	I				1.4E+09		1	0.1	Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9							8.5E+05	8.5E+05
															Polynuclear Aromatic Hydrocarbons (PAHs)									
				6.0E-02	I			V			1.4E+09	1.4E+05	1	0.13	~Acenaphthene	83-32-9					4.7E+03	1.5E+04		3.6E+03
				3.0E-01	I			V			1.4E+09	5.2E+05	1	0.13	~Anthracene	120-12-7					2.3E+04	7.6E+04		1.8E+04
1.0E-01	E	6.0E-05	E					V	M		1.4E+09	4.4E+06	1	0.13	~Benz[a]anthracene	56-55-3	1.5E+02	4.6E+02	7.4E+03	1.1E+02				
1.2E+00	C	1.1E-04	C								1.4E+09		1	0.13	~Benzo(j)fluoranthene	205-82-3	5.8E+01	1.6E+02	3.5E+06	4.2E+01				
1.0E+00	I	6.0E-04	I	3.0E-04	I	2.0E-06	I		M		1.4E+09		1	0.13	~Benzo[a]pyrene	50-32-8	1.5E+01	4.6E+01	2.3E+05	1.1E+01	2.3E+01	7.6E+01	2.8E+03	1.8E+01
1.0E-01	E	6.0E-05	E						M		1.4E+09		1	0.13	~Benzo[b]fluoranthene	205-99-2	1.5E+02	4.6E+02	2.3E+06	1.1E+02				
1.0E-02	E	6.0E-06	E						M		1.4E+09		1	0.13	~Benzo[k]fluoranthene	207-08-9	1.5E+03	4.6E+03	2.3E+07	1.1E+03				
				8.0E-02	I			V			1.4E+09	8.0E+04	1	0.13	~Chloronaphthalene, Beta-	91-58-7					6.3E+03	2.0E+04		4.8E+03
1.0E-03	E	6.0E-07	E						M		1.4E+09		1	0.13	~Chrysene	218-01-9	1.5E+04	4.6E+04	2.3E+08	1.1E+04				
1.0E+00	E	6.0E-04	E						M		1.4E+09		1	0.13	~Dibenz[a,h]anthracene	53-70-3	1.5E+01	4.6E+01	2.3E+05	1.1E+01				
1.2E+01	C	1.1E-03	C								1.4E+09		1	0.13	~Dibenzo(a,e)pyrene	192-65-4	5.8E+00	1.6E+01	3.5E+05	4.2E+00				
2.5E+02	C	7.1E-02	C						M		1.4E+09		1	0.13	~Dimethylbenz(a)anthracene, 7,12-	57-97-6	6.1E-02	1.8E-01	1.9E+03	4.6E-02				
				4.0E-02	I						1.4E+09		1	0.13	~Fluoranthene	206-44-0					3.1E+03	1.0E+04		2.4E+03
				4.0E-02	I			V			1.4E+09	2.8E+05	1	0.13	~Fluorene	86-73-7					3.1E+03	1.0E+04		2.4E+03
1.0E-01	E	6.0E-05	E						M		1.4E+09		1	0.13	~Indeno[1,2,3-cd]pyrene	193-39-5	1.5E+02	4.6E+02	2.3E+06	1.1E+02				
2.9E-02	P			7.0E-02	A			V		3.9E+02	1.4E+09	5.9E+04	1	0.13	~Methylnaphthalene, 1-	90-12-0	2.4E+03	6.6E+03		1.8E+03	5.5E+03	1.8E+04		4.2E+03
				4.0E-03	I			V			1.4E+09	5.8E+04	1	0.13	~Methylnaphthalene, 2-	91-57-6					3.1E+02	1.0E+03		2.4E+02
		3.4E-05	C	2.0E-02	I	3.0E-03	I	V			1.4E+09	4.6E+04	1	0.13	~Naphthalene	91-20-3			3.8E+02	3.8E+02	1.6E+03	5.1E+03	1.4E+02	1.3E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
1.2E+00	C	1.1E-04	C								1.4E+09		1	0.13	~Nitropyrene, 4-	57835-92-4	5.8E+01	1.6E+02	3.5E+06	4.2E+01				
				3.0E-02	I			V			1.4E+09	2.4E+06	1	0.13	~Pyrene	129-00-0					2.3E+03	7.6E+03		1.8E+03
				2.0E-02	P						1.4E+09		1	0.1	Potassium Perfluorobutane Sulfonate	29420-49-3					1.6E+03	6.6E+03		1.3E+03
1.5E-01	I			9.0E-03	I						1.4E+09		1	0.1	Prochloraz	67747-09-5	4.6E+02	1.6E+03		3.6E+02	7.0E+02	3.0E+03		5.7E+02
				6.0E-03	H			V			1.4E+09	4.2E+05	1		Profluralin	26399-36-0					4.7E+02			4.7E+02
				1.5E-02	I						1.4E+09		1	0.1	Prometon	1610-18-0					1.2E+03	4.9E+03		9.5E+02
				4.0E-02	O						1.4E+09		1	0.1	Prometryn	7287-19-6					3.1E+03	1.3E+04		2.5E+03
				7.5E-02	I						1.4E+09		1	0.1	Pronamide	23950-58-5					5.9E+03	2.5E+04		4.7E+03
				1.3E-02	I						1.4E+09		1	0.1	Propachlor	1918-16-7					1.0E+03	4.3E+03		8.2E+02
				5.0E-03	I						1.4E+09		1	0.1	Propanil	709-98-8					3.9E+02	1.6E+03		3.2E+02
1.9E-01	O			4.0E-02	O						1.4E+09		1	0.1	Propargite	2312-35-8	3.6E+02	1.3E+03		2.8E+02	3.1E+03	1.3E+04		2.5E+03
				2.0E-03	I			V		1.1E+05	1.4E+09	6.3E+04	1		Propargyl Alcohol	107-19-7					1.6E+02			1.6E+02
				2.0E-02	I						1.4E+09		1	0.1	Propazine	139-40-2					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	I						1.4E+09		1	0.1	Propham	122-42-9					1.6E+03	6.6E+03		1.3E+03
				1.0E-01	O						1.4E+09		1	0.1	Propiconazole	60207-90-1					7.8E+03	3.3E+04		6.3E+03
						8.0E-03	I	V		3.3E+04	1.4E+09	8.9E+03	1		Propionaldehyde	123-38-6							7.5E+01	7.5E+01
				1.0E-01	X	1.0E+00	X	V		2.6E+02	1.4E+09	7.0E+03	1		Propyl benzene	103-65-1					7.8E+03		7.3E+03	3.8E+03
						3.0E+00	C	V		3.5E+02	1.4E+09	7.0E+02	1		Propylene	115-07-1							2.2E+03	2.2E+03
				2.0E+01	P						1.4E+09		1	0.1	Propylene Glycol	57-55-6					1.6E+06	6.6E+06		1.3E+06
						2.7E-04	A				1.4E+09		1	0.1	Propylene Glycol Dinitrate	6423-43-4							3.9E+05	3.9E+05
				7.0E-01	H	2.0E+00	I	V		1.1E+05	1.4E+09	7.8E+04	1		Propylene Glycol Monomethyl Ether	107-98-2					5.5E+04		1.6E+05	4.1E+04
2.4E-01	I	3.7E-06	I			3.0E-02	I	V		7.8E+04	1.4E+09	1.0E+04	1		Propylene Oxide	75-56-9	2.9E+02		7.8E+02	2.1E+02			3.2E+02	3.2E+02
				1.0E-03	I			V		5.3E+05	1.4E+09	5.5E+04	1		Pyridine	110-86-1					7.8E+01			7.8E+01
				5.0E-04	I						1.4E+09		1	0.1	Quinalphos	13593-03-8					3.9E+01	1.6E+02		3.2E+01
3.0E+00	I										1.4E+09		1	0.1	Quinoline	91-22-5	2.3E+01	8.2E+01		1.8E+01				
				9.0E-03	I						1.4E+09		1	0.1	Quizalofop-ethyl	76578-14-8					7.0E+02	3.0E+03		5.7E+02
						3.0E+04	A						1		Refractory Ceramic Fibers (units in fibers)	E715557								
				3.0E-02	I						1.4E+09		1	0.1	Resmethrin	10453-86-8					2.3E+03	9.9E+03		1.9E+03
				5.0E-02	H			V			1.4E+09	4.7E+05	1		Ronnel	299-84-3					3.9E+03			3.9E+03
				4.0E-03	I						1.4E+09		1	0.1	Rotenone	83-79-4					3.1E+02	1.3E+03		2.5E+02
2.2E-01	C	6.3E-05	C						M		1.4E+09		1	0.1	Safrole	94-59-7	7.0E+01	2.7E+02	2.2E+06	5.5E+01				
				5.0E-03	I						1.4E+09		1		Selenious Acid	7783-00-8					3.9E+02			3.9E+02
				5.0E-03	I	2.0E-02	C				1.4E+09		1		Selenium	7782-49-2					3.9E+02		2.8E+07	3.9E+02
				5.0E-03	C	2.0E-02	C				1.4E+09		1		Selenium Sulfide	7446-34-6					3.9E+02		2.8E+07	3.9E+02
				1.4E-01	O						1.4E+09		1	0.1	Sethoxydim	74051-80-2					1.1E+04	4.6E+04		8.8E+03
						3.0E-03	C				1.4E+09		1		Silica (crystalline, respirable)	7631-86-9							4.3E+06	4.3E+06
				5.0E-03	I						1.4E+09		0.04		Silver	7440-22-4					3.9E+02			3.9E+02
1.2E-01	H			5.0E-03	I						1.4E+09		1	0.1	Simazine	122-34-9	5.8E+02	2.1E+03		4.5E+02	3.9E+02	1.6E+03		3.2E+02
				1.3E-02	I						1.4E+09		1	0.1	Sodium Acifluorfen	62476-59-9					1.0E+03	4.3E+03		8.2E+02
				4.0E-03	I						1.4E+09		1		Sodium Azide	26628-22-8					3.1E+02			3.1E+02
2.7E-01	H			3.0E-02	I						1.4E+09		1	0.1	Sodium Diethyldithiocarbamate	148-18-5	2.6E+02	9.2E+02		2.0E+02	2.3E+03	9.9E+03		1.9E+03
				5.0E-02	A	1.3E-02	C				1.4E+09		1		Sodium Fluoride	7681-49-4					3.9E+03		1.8E+07	3.9E+03
				2.0E-05	I						1.4E+09		1	0.1	Sodium Fluoroacetate	62-74-8					1.6E+00	6.6E+00		1.3E+00
				1.0E-03	H						1.4E+09		1		Sodium Metavanadate	13718-26-8					7.8E+01			7.8E+01
				8.0E-04	P						1.4E+09		1		Sodium Tungstate	13472-45-2					6.3E+01			6.3E+01
				8.0E-04	P						1.4E+09		1		Sodium Tungstate Dihydrate	10213-10-2					6.3E+01			6.3E+01
2.4E-02	H			3.0E-02	I						1.4E+09		1	0.1	Stirofos (Tetrachlorovinphos)	961-11-5	2.9E+03	1.0E+04		2.3E+03	2.3E+03	9.9E+03		1.9E+03
				6.0E-01	I						1.4E+09		1		Strontium, Stable	7440-24-6					4.7E+04			4.7E+04
				3.0E-04	I						1.4E+09		1	0.1	Strychnine	57-24-9					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	I	1.0E+00	I	V		8.7E+02	1.4E+09	9.4E+03	1		Styrene	100-42-5					1.6E+04		9.7E+03	6.0E+03
				3.0E-03	P						1.4E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3					2.3E+02	9.9E+02		1.9E+02
				3.0E-03	P						1.4E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6					2.3E+02	9.9E+02		1.9E+02
				1.0E-03	P	2.0E-03	X				1.4E+09		1	0.1	Sulfolane	126-33-0					7.8E+01	3.3E+02	2.8E+06	6.3E+01
				8.0E-04	P						1.4E+09		1	0.1	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					6.3E+01	2.6E+02		5.1E+01
						1.0E-03	C	V			1.4E+09		1		Sulfur Trioxide	7446-11-9							1.4E+06	1.4E+06
						1.0E-03	C				1.4E+09		1		Sulfuric Acid	7664-93-9							1.4E+06	1.4E+06
2.5E-02	I	7.1E-06	I	5.0E-02	H						1.4E+09		1	0.1	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	2.8E+03	9.9E+03	5.4E+07	2.2E+03	3.9E+03	1.6E+04		3.2E+03
				3.0E-02	H						1.4E+09		1	0.1	TCMTB	21564-17-0					2.3E+03	9.9E+03		1.9E+03
				7.0E-02	I						1.4E+09		1	0.1	Tebuthiuron	34014-18-1					5.5E+03	2.3E+04		4.4E+03
				2.0E-02	H						1.4E+09		1	0.1	Temephos	3383-96-8					1.6E+03	6.6E+03		1.3E+03
				1.3E-02	I						1.4E+09		1	0.1	Terbacil	5902-51-2					1.0E+03	4.3E+03		8.2E+02
				2.5E-05	H			V		3.1E+01	1.4E+09	2.6E+05	1		Terbufos	13071-79-9					2.0E+00			2.0E+00
				1.0E-03	I						1.4E+09		1	0.1	Terbutryn	886-50-0					7.8E+01	3.3E+02		6.3E+01
5.0E-03	C	1.3E-06	C					V			1.4E+09	4.0E+03	1		Tert-Butyl Acetate	540-88-5	1.4E+04		8.6E+02	8.1E+02				
				1.0E-04	I						1.4E+09		1	0.1	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					7.8E+00	3.3E+01		6.3E+00
				3.0E-04	I			V			1.4E+09	5.1E+04	1		Tetrachlorobenzene, 1,2,4,5-	95-94-3					2.3E+01			2.3E+01
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		6.8E+02	1.4E+09	5.7E+03	1		Tetrachloroethane, 1,1,1,2-	630-20-6	2.7E+03		2.2E+02	2.0E+02	2.3E+03			2.3E+03
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1.9E+03	1.4E+09	1.5E+04	1		Tetrachloroethane, 1,1,2,2-	79-34-5	3.5E+02		7.3E+01	6.0E+01	1.6E+03			1.6E+03
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		1.7E+02	1.4E+09	2.4E+03	1		Tetrachloroethylene	127-18-4	3.3E+04		2.5E+03	2.4E+03	4.7E+02		9.8E+01	8.1E+01
				3.0E-02	I						1.4E+09		1	0.1	Tetrachlorophenol, 2,3,4,6-	58-90-2					2.3E+03	9.9E+03		1.9E+03
2.0E+01	H							V			1.4E+09	1.1E+05	1		Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	3.5E+00			3.5E+00				
				5.0E-04	I						1.4E+09		1	0.1	Tetraethyl Dithiopyrophosphate	3689-24-5					3.9E+01	1.6E+02		3.2E+01
						8.0E+01	I	V		2.1E+03	1.4E+09	1.2E+03	1		Tetrafluoroethane, 1,1,1,2-	811-97-2							1.0E+05	1.0E+05
				2.0E-03	P						1.4E+09		1	0.00065	Tetryl (Trinitrophenylmethylnitramine)	479-45-8					1.6E+02	1.0E+05		1.6E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				2.0E-05	G						1.4E+09		1		Thallic Oxide	1314-32-5					1.6E+00			1.6E+00
				1.0E-05	X						1.4E+09		1		Thallium (I) Nitrate	10102-45-1					7.8E-01			7.8E-01
				1.0E-05	X						1.4E+09		1		Thallium (Soluble Salts)	7440-28-0					7.8E-01			7.8E-01
				1.0E-05	X			V			1.4E+09		1		Thallium Acetate	563-68-8					7.8E-01			7.8E-01
				2.0E-05	X			V			1.4E+09		1		Thallium Carbonate	6533-73-9					1.6E+00			1.6E+00
				1.0E-05	X						1.4E+09		1		Thallium Chloride	7791-12-0					7.8E-01			7.8E-01
				1.0E-05	G						1.4E+09		1		Thallium Selenite	12039-52-0					7.8E-01			7.8E-01
				2.0E-05	X						1.4E+09		1		Thallium Sulfate	7446-18-6					1.6E+00			1.6E+00
				4.3E-02	O						1.4E+09		1	0.1	Thifensulfuron-methyl	79277-27-3					3.4E+03	1.4E+04		2.7E+03
				1.0E-02	I						1.4E+09		1	0.1	Thiobencarb	28249-77-6					7.8E+02	3.3E+03		6.3E+02
				7.0E-02	X						1.4E+09		1	0.0075	Thiodiglycol	111-48-8					5.5E+03	3.1E+05		5.4E+03
				3.0E-04	H						1.4E+09		1	0.1	Thiofanox	39196-18-4					2.3E+01	9.9E+01		1.9E+01
1.2E-02	O			2.7E-02	O						1.4E+09		1	0.1	Thiophanate, Methyl	23564-05-8	6.0E+03	2.1E+04		4.7E+03	2.1E+03	8.9E+03		1.7E+03
				1.5E-02	O						1.4E+09		1	0.1	Thiram	137-26-8					1.2E+03	4.9E+03		9.5E+02
				6.0E-01	H						1.4E+09		1		Tin	7440-31-5					4.7E+04			4.7E+04
						1.0E-04	A	V			1.4E+09		1		Titanium Tetrachloride	7550-45-0							1.4E+05	1.4E+05
				8.0E-02	I	5.0E+00	I	V		8.2E+02	1.4E+09	4.3E+03	1		Toluene	108-88-3					6.3E+03		2.2E+04	4.9E+03
3.9E-02	C	1.1E-05	C			8.0E-06	C	V			1.4E+09	7.6E+05	1		Toluene-2,4-diisocyanate	584-84-9	1.8E+03		1.9E+04	1.6E+03			6.4E+00	6.4E+00
1.8E-01	X			2.0E-04	X						1.4E+09		1	0.1	Toluene-2,5-diamine	95-70-5	3.9E+02	1.4E+03		3.0E+02	1.6E+01	6.6E+01		1.3E+01
3.9E-02	C	1.1E-05	C			8.0E-06	C	V		1.7E+03	1.4E+09	6.3E+05	1		Toluene-2,6-diisocyanate	91-08-7	1.8E+03		1.6E+04	1.6E+03			5.3E+00	5.3E+00
				5.0E-03	P						1.4E+09		1	0.1	Toluic Acid, p-	99-94-5					3.9E+02	1.6E+03		3.2E+02
1.6E-02	P	5.1E-05	C								1.4E+09		1	0.1	Toluidine, o- (Methylaniline, 2-)	95-53-4	4.3E+03	1.5E+04	7.5E+06	3.4E+03				
3.0E-02	P			4.0E-03	X						1.4E+09		1	0.1	Toluidine, p-	106-49-0	2.3E+03	8.2E+03		1.8E+03	3.1E+02	1.3E+03		2.5E+02
				3.0E+00	P			V		3.4E-01	1.4E+09	1.4E+03	1		Total Petroleum Hydrocarbons (Aliphatic High)	E1790670					2.3E+05			2.3E+05
						6.0E-01	P	V		1.4E+02	1.4E+09	8.3E+02	1		Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666							5.2E+02	5.2E+02
				1.0E-02	X	1.0E-01	P	V		6.9E+00	1.4E+09	1.0E+03	1		Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668					7.8E+02		1.1E+02	9.6E+01
				4.0E-02	P						1.4E+09		1	0.1	Total Petroleum Hydrocarbons (Aromatic High)	E1790676					3.1E+03	1.3E+04		2.5E+03
				4.0E-03	P	3.0E-02	P	V		1.8E+03	1.4E+09	3.5E+03	1		Total Petroleum Hydrocarbons (Aromatic Low)	E1790672					3.1E+02		1.1E+02	8.2E+01
				4.0E-03	P	3.0E-03	P	V			1.4E+09	5.2E+04	1		Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674					3.1E+02		1.6E+02	1.1E+02
1.1E+00	I	3.2E-04	I	9.0E-05	P						1.4E+09		1	0.1	Toxaphene	8001-35-2	6.3E+01	2.2E+02	1.2E+06	4.9E+01	7.0E+00	3.0E+01		5.7E+00
				3.0E-05	X						1.4E+09		1	0.1	Toxaphene, Weathered	E1841606					2.3E+00	9.9E+00		1.9E+00
				7.5E-03	I						1.4E+09		1	0.1	Tralomethrin	66841-25-6					5.9E+02	2.5E+03		4.7E+02
				3.0E-04	A			V			1.4E+09	3.4E+03	1		Tri-n-butyltin	688-73-3					2.3E+01			2.3E+01
				8.0E+01	X						1.4E+09		1	0.1	Triacetin	102-76-1					6.3E+06	2.6E+07		5.1E+06
				3.4E-02	O						1.4E+09		1	0.1	Triadimefon	43121-43-3					2.7E+03	1.1E+04		2.1E+03
7.2E-02	O			2.5E-02	O			V			1.4E+09	3.6E+05	1		Triallate	2303-17-5	9.7E+02			9.7E+02	2.0E+03			2.0E+03
				1.0E-02	I						1.4E+09		1	0.1	Triasulfuron	82097-50-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.4E+09		1	0.1	Tribenuron-methyl	101200-48-0					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V			1.4E+09	4.8E+04	1		Tribromobenzene, 1,2,4-	615-54-3					3.9E+02			3.9E+02
				9.0E-03	X						1.4E+09		1	0.1	Tribromophenol, 2,4,6-	118-79-6					7.0E+02	3.0E+03		5.7E+02
9.0E-03	P			1.0E-02	P						1.4E+09		1	0.1	Tributyl Phosphate	126-73-8	7.7E+03	2.7E+04		6.0E+03	7.8E+02	3.3E+03		6.3E+02
				3.0E-04	P						1.4E+09		1	0.1	Tributyltin Compounds	E1790678					2.3E+01	9.9E+01		1.9E+01
				3.0E-04	I						1.4E+09		1	0.1	Tributyltin Oxide	56-35-9					2.3E+01	9.9E+01		1.9E+01
											1.4E+09				Trichloramine	10025-85-1								
				3.0E+01	I	5.0E+00	P	V		9.1E+02	1.4E+09	1.3E+03	1		Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					2.3E+06		6.7E+03	6.7E+03
7.0E-02	I			2.0E-02	I						1.4E+09		1	0.1	Trichloroacetic Acid	76-03-9	9.9E+02	3.5E+03		7.8E+02	1.6E+03	6.6E+03		1.3E+03
2.9E-02	H										1.4E+09		1	0.1	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.4E+03	8.5E+03		1.9E+03				
7.0E-03	X			3.0E-05	X						1.4E+09		1	0.1	Trichloroaniline, 2,4,6-	634-93-5	9.9E+03	3.5E+04		7.8E+03	2.3E+00	9.9E+00		1.9E+00
				8.0E-04	X			V			1.4E+09	3.2E+04	1		Trichlorobenzene, 1,2,3-	87-61-6					6.3E+01			6.3E+01
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		4.0E+02	1.4E+09	3.0E+04	1		Trichlorobenzene, 1,2,4-	120-82-1	2.4E+03			2.4E+03	7.8E+02		6.2E+01	5.8E+01
				2.0E+00	I	5.0E+00	I	V		6.4E+02	1.4E+09	1.7E+03	1		Trichloroethane, 1,1,1-	71-55-6					1.6E+05		8.6E+03	8.1E+03
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		2.2E+03	1.4E+09	7.2E+03	1		Trichloroethane, 1,1,2-	79-00-5	1.2E+03		1.3E+02	1.1E+02	3.1E+02		1.5E+00	1.5E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	6.9E+02	1.4E+09	2.2E+03	1		Trichloroethylene	79-01-6	8.8E+02		1.1E+02	9.4E+01	3.9E+01		4.6E+00	4.1E+00
				3.0E-01	I			V		1.2E+03	1.4E+09	1.0E+03	1		Trichlorofluoromethane	75-69-4					2.3E+04			2.3E+04
				1.0E-01	I						1.4E+09		1	0.1	Trichlorophenol, 2,4,5-	95-95-4					7.8E+03	3.3E+04		6.3E+03
1.1E-02	I	3.1E-06	I	1.0E-03	P						1.4E+09		1	0.1	Trichlorophenol, 2,4,6-	88-06-2	6.3E+03	2.2E+04	1.2E+08	4.9E+03	7.8E+01	3.3E+02		6.3E+01
				1.0E-02	I						1.4E+09		1	0.1	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.4E+09		1	0.1	Trichlorophenoxypropionic acid, -2,4,5	93-72-1					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V		1.3E+03	1.4E+09	1.5E+04	1		Trichloropropane, 1,1,2-	598-77-6					3.9E+02			3.9E+02
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1.4E+03	1.4E+09	1.6E+04	1		Trichloropropane, 1,2,3-	96-18-4	5.1E-01			5.1E-01	3.1E+02		4.9E+00	4.8E+00
				3.0E-03	X	3.0E-04	P	V		3.1E+02	1.4E+09	2.3E+03	1		Trichloropropene, 1,2,3-	96-19-5					2.3E+02		7.3E-01	7.3E-01
				2.0E-02	A						1.4E+09		1	0.1	Tricresyl Phosphate (TCP)	1330-78-5					1.6E+03	6.6E+03		1.3E+03
				3.0E-03	I						1.4E+09		1	0.1	Tridiphane	58138-08-2					2.3E+02	9.9E+02		1.9E+02
						7.0E-03	I	V		2.8E+04	1.4E+09	1.6E+04	1		Triethylamine	121-44-8							1.2E+02	1.2E+02
				2.0E+00	P						1.4E+09		1	0.1	Triethylene Glycol	112-27-6					1.6E+05	6.6E+05		1.3E+05
						2.0E+01	P	V		4.8E+03	1.4E+09	7.1E+02	1		Trifluoroethane, 1,1,1-	420-46-2							1.5E+04	1.5E+04
7.7E-03	I			7.5E-03	I			V			1.4E+09	5.1E+05	1		Trifluralin	1582-09-8	9.0E+03			9.0E+03	5.9E+02			5.9E+02
2.0E-02	P			1.0E-02	P						1.4E+09		1	0.1	Trimethyl Phosphate	512-56-1	3.5E+03	1.2E+04		2.7E+03	7.8E+02	3.3E+03		6.3E+02
				1.0E-02	I	6.0E-02	I	V		2.9E+02	1.4E+09	9.4E+03	1		Trimethylbenzene, 1,2,3-	526-73-8					7.8E+02		5.9E+02	3.4E+02
				1.0E-02	I	6.0E-02	I	V		2.2E+02	1.4E+09	7.9E+03	1		Trimethylbenzene, 1,2,4-	95-63-6					7.8E+02		5.0E+02	3.0E+02
				1.0E-02	I	6.0E-02	I	V		1.8E+02	1.4E+09	6.6E+03	1		Trimethylbenzene, 1,3,5-	108-67-8					7.8E+02		4.1E+02	2.7E+02
				1.0E-02	X			V		3.0E+01	1.4E+09	1.0E+03	1		Trimethylpentene, 2,4,4-	25167-70-8					7.8E+02			7.8E+02
				3.0E-02	I						1.4E+09		1	0.019	Trinitrobenzene, 1,3,5-	99-35-4					2.3E+03	5.2E+04		2.2E+03
3.0E-02	I			5.0E-04	I						1.4E+09		1	0.032	Trinitrotoluene, 2,4,6-	118-96-7	2.3E+03	2.6E+04		2.1E+03	3.9E+01	5.2E+02		3.6E+01

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied;
c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	vol	mutagen	C$_{sat}$ (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS$_d$	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				2.0E-02	P						1.4E+09		1	0.1	Triphenylphosphine Oxide	791-28-6					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	A						1.4E+09		1	0.1	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8					1.6E+03	6.6E+03		1.3E+03
				1.0E-02	X						1.4E+09		1	0.1	Tris(1-chloro-2-propyl)phosphate	13674-84-5					7.8E+02	3.3E+03		6.3E+02
2.3E+00	C	6.6E-04	C					V		4.7E+02	1.4E+09	9.0E+05	1		Tris(2,3-dibromopropyl)phosphate	126-72-7	3.0E+01		3.8E+02	2.8E+01				
2.0E-02	P			7.0E-03	P						1.4E+09		1	0.1	Tris(2-chloroethyl)phosphate	115-96-8	3.5E+03	1.2E+04		2.7E+03	5.5E+02	2.3E+03		4.4E+02
3.2E-03	P			1.0E-01	P						1.4E+09		1	0.1	Tris(2-ethylhexyl)phosphate	78-42-2	2.2E+04	7.7E+04		1.7E+04	7.8E+03	3.3E+04		6.3E+03
				8.0E-04	P						1.4E+09		1		Tungsten	7440-33-7					6.3E+01			6.3E+01
				2.0E-04	A	4.0E-05	A				1.4E+09		1		Uranium (Soluble Salts)	E715565					1.6E+01		5.7E+04	1.6E+01
1.0E+00	C	2.9E-04	C						M		1.4E+09		1	0.1	Urethane	51-79-6	1.5E+01	6.0E+01	4.8E+05	1.2E+01				
		8.3E-03	P	9.0E-03	I	7.0E-06	P				1.4E+09		0.026		Vanadium Pentoxide	1314-62-1			4.6E+04	4.6E+04	7.0E+02		9.9E+03	6.6E+02
				5.0E-03	G	1.0E-04	A				1.4E+09		0.026		Vanadium and Compounds	7440-62-2					3.9E+02		1.4E+05	3.9E+02
				1.0E-03	I			V			1.4E+09	1.2E+05	1		Vernolate	1929-77-7					7.8E+01			7.8E+01
				1.2E-03	O						1.4E+09		1	0.1	Vinclozolin	50471-44-8					9.4E+01	4.0E+02		7.6E+01
				1.0E+00	H	2.0E-01	I	V		2.8E+03	1.4E+09	4.4E+03	1		Vinyl Acetate	108-05-4					7.8E+04		9.2E+02	9.1E+02
		3.2E-05	H			3.0E-03	I	V		2.5E+03	1.4E+09	1.4E+03	1		Vinyl Bromide	593-60-2			1.2E+01	1.2E+01			4.3E+00	4.3E+00
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	3.9E+03	1.4E+09	9.6E+02	1		Vinyl Chloride	75-01-4	9.4E+00		1.6E+01	5.9E+00	2.3E+02		1.0E+02	7.0E+01
				3.0E-04	I						1.4E+09		1	0.1	Warfarin	81-81-2					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	G	1.0E-01	G	V		3.9E+02	1.4E+09	5.6E+03	1		Xylene, P-	106-42-3					1.6E+04		5.8E+02	5.6E+02
				2.0E-01	G	1.0E-01	G	V		3.9E+02	1.4E+09	5.5E+03	1		Xylene, m-	108-38-3					1.6E+04		5.7E+02	5.5E+02
				2.0E-01	G	1.0E-01	G	V		4.3E+02	1.4E+09	6.5E+03	1		Xylene, o-	95-47-6					1.6E+04		6.7E+02	6.5E+02
				2.0E-01	I	1.0E-01	I	V		2.6E+02	1.4E+09	5.7E+03	1		Xylenes	1330-20-7					1.6E+04		6.0E+02	5.8E+02
				3.0E-04	I						1.4E+09		1		Zinc Phosphide	1314-84-7					2.3E+01			2.3E+01
				3.0E-01	I						1.4E+09		1		Zinc and Compounds	7440-66-6					2.3E+04			2.3E+04
				5.0E-02	I						1.4E+09		1	0.1	Zineb	12122-67-7					3.9E+03	1.6E+04		3.2E+03
				8.0E-05	X						1.4E+09		1		Zirconium	7440-67-7					6.3E+00			6.3E+00

375-6.8 Soil cleanup objective tables.

(a) Unrestricted use soil cleanup objectives.

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
Metals		
Arsenic	7440-38-2	13 [c]
Barium	7440-39-3	350 [c]
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5 [c]
Chromium, hexavalent [e]	18540-29-9	1[b]
Chromium, trivalent [e]	16065-83-1	30 [c]
Copper	7440-50-8	50
Total Cyanide [e, f]		27
Lead	7439-92-1	63 [c]
Manganese	7439-96-5	1600 [c]
Total Mercury		0.18 [c]
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9[c]
Silver	7440-22-4	2
Zinc	7440-66-6	109 [c]
PCBs/Pesticides		
2,4,5-TP Acid (Silvex) [f]	93-72-1	3.8
4,4'-DDE	72-55-9	0.0033 [b]
4,4'-DDT	50-29-3	0.0033 [b]
4,4'-DDD	72-54-8	0.0033 [b]
Aldrin	309-00-2	0.005 [c]
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.036
Chlordane (alpha)	5103-71-9	0.094

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
delta-BHC [g]	319-86-8	0.04
Dibenzofuran [f]	132-64-9	7
Dieldrin	60-57-1	0.005 [c]
Endosulfan I [d, f]	959-98-8	2.4
Endosulfan II [d, f]	33213-65-9	2.4
Endosulfan sulfate [d, f]	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	0.1
Semivolatile organic compounds		
Acenaphthene	83-32-9	20
Acenapthylene [f]	208-96-8	100 [a]
Anthracene [f]	120-12-7	100 [a]
Benz(a)anthracene [f]	56-55-3	1 [c]
Benzo(a)pyrene	50-32-8	1 [c]
Benzo(b)fluoranthene [f]	205-99-2	1 [c]
Benzo(g,h,i)perylene [f]	191-24-2	100
Benzo(k)fluoranthene [f]	207-08-9	0.8 [c]
Chrysene [f]	218-01-9	1 [c]
Dibenz(a,h)anthracene [f]	53-70-3	0.33 [b]
Fluoranthene [f]	206-44-0	100 [a]
Fluorene	86-73-7	30
Indeno(1,2,3-cd)pyrene [f]	193-39-5	0.5 [c]
m-Cresol [f]	108-39-4	0.33 [b]
Naphthalene [f]	91-20-3	12
o-Cresol [f]	95-48-7	0.33 [b]

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
p-Cresol [f]	106-44-5	0.33 [b]
Pentachlorophenol	87-86-5	0.8 [b]
Phenanthrene [f]	85-01-8	100
Phenol	108-95-2	0.33 [b]
Pyrene [f]	129-00-0	100
Volatile organic compounds		
1,1,1-Trichloroethane [f]	71-55-6	0.68
1,1-Dichloroethane [f]	75-34-3	0.27
1,1-Dichloroethene [f]	75-35-4	0.33
1,2-Dichlorobenzene [f]	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02 [c]
cis -1,2-Dichloroethene [f]	156-59-2	0.25
trans-1,2-Dichloroethene [f]	156-60-5	0.19
1,3-Dichlorobenzene [f]	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1 [b]
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
n-Butylbenzene [f]	104-51-8	12
Carbon tetrachloride [f]	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene [f]	100-41-4	1
Hexachlorobenzene [f]	118-74-1	0.33[b]
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether [f]	1634-04-4	0.93
Methylene chloride	75-09-2	0.05

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
n - Propylbenzene [f]	103-65-1	3.9
sec-Butylbenzene [f]	135-98-8	11
tert-Butylbenzene [f]	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene [f]	95-63-6	3.6
1,3,5-Trimethylbenzene[f]	108-67-8	8.4
Vinyl chloride[f]	75-01-4	0.02
Xylene (mixed)	1330-20-7	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm).

Footnotes

[a] The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See Technical Support Document (TSD), section 9.3.

[b] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.

[c] For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.

[d] SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.

[e] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[f] Protection of ecological resources SCOs were not developed for contaminants identified in Table 375-6.8(b) with “NS”. Where such contaminants appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]
Barium	7440-39-3	350[f]	400	400	10,000 [d]	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5[f]	4.3	9.3	60	4	7.5
Chromium, hexavalent [h]	18540-29-9	22	110	400	800	1[e]	19
Chromium, trivalent [h]	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 [d]	50	1,720
Total Cyanide [h]		27	27	27	10,000 [d]	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63[f]	450
Manganese	7439-96-5	2,000[f]	2,000[f]	10,000 [d]	10,000 [d]	1600[f]	2,000[f]
Total Mercury		0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73
Nickel	7440-02-0	140	310	310	10,000 [d]	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9[f]	4[f]
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 [d]	10,000 [d]	10,000 [d]	109[f]	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100[a]	500[b]	1,000[c]	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 [e]	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 [e]	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033 [e]	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04[g]	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100[a]	100[a]	500[b]	1,000[c]	0.04[g]	0.25
Dibenzofuran	132-64-9	14	59	350	1,000[c]	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan II	33213-65-9	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan sulfate	1031-07-8	4.8[i]	24[i]	200[i]	920[i]	NS	1,000[c]
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100[a]	100[a]	500[b]	1,000[c]	20	98
Acenapthylene	208-96-8	100[a]	100[a]	500[b]	1,000[c]	NS	107
Anthracene	120-12-7	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benz(a)anthracene	56-55-3	1[f]	1[f]	5.6	11	NS	1[f]
Benzo(a)pyrene	50-32-8	1[f]	1[f]	1[f]	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1[f]	1[f]	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1[f]	3.9	56	110	NS	1[f]
Dibenz(a,h)anthracene	53-70-3	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]
Fluoranthene	206-44-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Fluorene	86-73-7	100[a]	100[a]	500[b]	1,000[c]	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5[f]	0.5[f]	5.6	11	NS	8.2
m-Cresol	108-39-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
Naphthalene	91-20-3	100[a]	100[a]	500[b]	1,000[c]	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
p-Cresol	106-44-5	34	100[a]	500[b]	1,000[c]	NS	0.33[e]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8[e]	0.8[e]
Phenanthrene	85-01-8	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Phenol	108-95-2	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]
Pyrene	129-00-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Volatiles							
1,1,1-Trichloroethane	71-55-6	100[a]	100[a]	500[b]	1,000[c]	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33
1,2-Dichlorobenzene	95-50-1	100[a]	100[a]	500[b]	1,000[c]	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02[f]
cis-1,2-Dichloroethene	156-59-2	59	100[a]	500[b]	1,000[c]	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100[a]	100[a]	500[b]	1,000[c]	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1[e]	0.1[e]
Acetone	67-64-1	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100[a]	100[a]	500[b]	1,000[c]	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100[a]	100[a]	500[b]	1,000[c]	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33[e]	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100[a]	100[a]	500[b]	1,000[c]	100[a]	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100[a]	500[b]	1,000[c]	NS	0.93
Methylene chloride	75-09-2	51	100[a]	500[b]	1,000[c]	12	0.05
n-Propylbenzene	103-65-1	100[a]	100[a]	500[b]	1,000[c]	NS	3.9
sec-Butylbenzene	135-98-8	100[a]	100[a]	500[b]	1,000[c]	NS	11
tert-Butylbenzene	98-06-6	100[a]	100[a]	500[b]	1,000[c]	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100[a]	100[a]	500[b]	1,000[c]	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).
NS=Not specified. See Technical Support Document (TSD).

Footnotes

[a] The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

[b] The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

[c] The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

[d] The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

[e] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

[f] For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

[g] This SCO is derived from data on mixed isomers of BHC.

[h] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[i] This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

[j] This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

375-6.9 Development or modification of soil cleanup objectives.

(a) Applicability. This section identifies when and the procedures under which a contaminant-specific soil cleanup objective may be developed or modified.

(1) Soil cleanup objectives for contaminants not included in Tables 375-6.8(a) and (b) may be developed by the remedial party or required by the Department.

(2) Soil cleanup objectives for contaminants included in Tables 375-6.8(a) and (b), may be modified based on site-specific data if desired by the remedial party; as set forth in:

(i) subpart 375-3 for Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(iii) and subparagraph 375-4.8(c)(1)(iii).

(3) Protection of ecological resources soil cleanup objectives were not developed for certain contaminants, which are identified in Table 375-6.8(b) as "NS". Where such contaminants:

(i) appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources soil cleanup objective for the contaminant for use in Track 1 and apply such soil cleanup objective where it is lower than the soil cleanup objective set forth in Table 375-6.8(a); or

(ii) are identified as impacting or threatening an ecological resource for a restricted use remedial program the Department may require a protection of ecological resources soil cleanup objective be developed.

(b) New soil cleanup objectives must:

(1) Be developed utilizing the same methodologies that were used by the Department to develop the respective soil cleanup objective, as provided in the Technical Support Document.

(2) Apply the following caps, as set forth in section 9.3 of the Technical Support Document, on any soil cleanup objective included in Tables 375-6.8(a) and (b), with the exception of metals, as set forth in paragraph (3) below, developed for:

(i) unrestricted use, residential use, restricted-residential use and the protection of ecological resources, a maximum value of 100 ppm;

(ii) commercial use, a maximum value of 500 ppm; and

(iii) industrial use and the protection of groundwater a maximum value of 1000 ppm, and

(3) Apply a cap for metals at a maximum value of 10,000 ppm.

(c) Development of unrestricted use soil cleanup objectives. The unrestricted use soil cleanup objective for a compound will be the lowest of the soil cleanup values, calculated as set forth in appendix E of the Technical Support Document, for the protection of groundwater, protection of ecological resources and protection of public health.

(d) Development of restricted use soil cleanup objectives. The protection of:

(1) Groundwater soil cleanup objective will be the values calculated for the protection of groundwater as set forth in appendix E of the Technical Support Document;

(2) Ecological resources soil cleanup objectives will be the values calculated for the protection of ecological resources as set forth in appendix E of the Technical Support Document; and

(3) Public health cleanup objective will be the values calculated for the protection of public health for the identified use of the site, as set forth in appendix E of the Technical Support Document.

(e) Modification of soil cleanup objectives. The contaminant-specific soil cleanup objectives set forth at Tables 675-6.8(a) and (b)[1] may be modified by site specific data as set forth in this subdivision.

[1] Original should read "Tables 375-6.8(a) and (b)"

(1) Contaminant-specific soil cleanup objectives modified in accordance with this subdivision may be utilized by the remedial party for a site remedial program undertaken pursuant to:

(i) subpart 375-3 in Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(ii) and subparagraph 375-4.8(c)(1)(ii).

(2) For the calculation of a protection of groundwater or ecological resources contaminant -specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in appendix E of the Technical Support Document.

(3) For the calculation of a protection of public health contaminant-specific soil cleanup objective, site-specific data may be used to modify two of the five exposure pathways, as follows:

(i) for the particulate inhalation pathway six parameters rely on site-specific data; and

(ii) for the volatile inhalation pathway, four parameters rely on site-specific data.

(4) The algorithms to be used for each protection of public health pathway and details on the parameters which can be substituted are included in appendix E of the Technical Support Document.

(f) Use of soil cleanup objectives developed or modified. Once approved by the Department, contaminant-specific soil cleanup objectives developed or modified as set forth in this section may be utilized by the Department at other sites consistent with paragraphs (1) and (2) below.

(1) Contaminant-specific soil cleanup objectives developed for contaminants not included in Tables 375-6.8(a) and (b), as set forth in subdivision 375-6.9(b) above, will be used as guidance and shall be considered by the Department for inclusion in the Tables in this subpart during any subsequent reevaluation of the soil cleanup objectives, as set forth by ECL 27-1415.

(2) Contaminant-specific soil cleanup objectives modified for site specific parameters, as set forth in subdivision 375-6.9(e) above, may be utilized at sites manifesting similar parameters, if approved by the Department.

Federal Register Notice

- Military Munitions Rule
  62 FR 6622, February 12, 1997

General Resources for the Reactivity Characteristic

- Background document for the Reactivity characteristic

Toxicity

The regulations for the hazardous characteristic of toxicity can be found at 40 CFR 261.24.

Regulations for Toxicity

§261.24

(a) A solid waste (except manufactured gas plant waste) exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW–846, as incorporated by reference in §260.11 of this chapter, the extract from a representative sample of the waste contains any of the contaminants listed in table 1 at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering using the methodology outlined in Method 1311, is considered to be the extract for the purpose of this section.

(b) A solid waste that exhibits the characteristic of toxicity has the EPA Hazardous Waste Number specified in Table 1 which corresponds to the toxic contaminant causing it to be hazardous.

Table 1 —Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA HW No.[1]	Contaminant	CAS No.[2]	Regulatory Level (mg/L)
D004	Arsenic	7440–38–2	5.0
D005	Barium	7440–39–3	100.0
D018	Benzene	71–43–2	0.5
D006	Cadmium	7440–43–9	1.0
D019	Carbon tetrachloride	56–23–5	0.5
D020	Chlordane	57–74–9	0.03
D021	Chlorobenzene	108–90–7	100.0
D022	Chloroform	67–66–3	6.0

D007	Chromium	7440–47–3	5.0
D023	o-Cresol	95–48–7	[4]200.0
D024	m-Cresol	108–39–4	[4]200.0
D025	p-Cresol	106–44–5	[4]200.0
D026	Cresol		[4]200.0
D016	2,4-D	94–75–7	10.0
D027	1,4-Dichlorobenzene	106–46–7	7.5
D028	1,2-Dichloroethane	107–06–2	0.5
D029	1,1-Dichloroethylene	75–35–4	0.7
D030	2,4-Dinitrotoluene	121–14–2	[3]0.13
D012	Endrin	72–20–8	0.02
D031	Heptachlor (and its epoxide)	76–44–8	0.008
D032	Hexachlorobenzene	118–74–1	[3]0.13
D033	Hexachlorobutadiene	87–68–3	0.5
D034	Hexachloroethane	67–72–1	3.0
D008	Lead	7439–92–1	5.0
D013	Lindane	58–89–9	0.4
D009	Mercury	7439–97–6	0.2
D014	Methoxychlor	72–43–5	10.0
D035	Methyl ethyl ketone	78–93–3	200.0
D036	Nitrobenzene	98–95–3	2.0
D037	Pentrachlorophenol	87–86–5	100.0
D038	Pyridine	110–86–1	[3]5.0
D010	Selenium	7782–49–2	1.0
D011	Silver	7440–22–4	5.0
D039	Tetrachloroethylene	127–18–4	0.7
D015	Toxaphene	8001–35–2	0.5
D040	Trichloroethylene	79–01–6	0.5
D041	2,4,5-Trichlorophenol	95–95–4	400.0
D042	2,4,6-Trichlorophenol	88–06–2	2.0

D017	2,4,5-TP (Silvex)	93–72–1	1.0
D043	Vinyl chloride	75–01–4	0.2

[1]Hazardous waste number.
[2]Chemical abstracts service number.
[3]Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.
[4]If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.
[55 FR 11862, Mar. 29, 1990, as amended at 55 FR 22684, June 1, 1990; 55 FR 26987, June 29, 1990; 58 FR 46049, Aug. 31, 1993; 67 FR 11254, Mar. 13, 2002; 71 FR 40259, July 14, 2006]

General Resources for the Toxicity Characteristic

- Methods for Determining Characteristics of Hazardous Waste, SW-846, Chapter 8

Federal Register Notices

- Final Rule: Toxicity Characteristic
  55 FR 11829: March 29, 1,90

- Proposed Rule: Hazardous Waste Management System; Modification of the Hazardous Waste Recycling Regulatory Program
  58 FR 8102, February 11, 1993

- Request for Comment on Proposed Statement of Policy Regarding Spent Antifreeze
  63 FR 20187, April 23, 1998

Letters/Memoranda

Antifreeze

- USED AUTOMOBILE ANTIFREEZE DISPOSAL
- SPENT ANTI-FREEZE COOLANT REGULATORY STATUS
- SPENT ANTIFREEZE AND THE TOXICITY CHARACTERISTIC

Biosolids

- BIOSOLIDS

Chromium/Trivalent Chromium

- HAZARDOUS WASTE TESTING ISSUES

PRG Output of the PRG Values

Th-232 Decay Chain:

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Produce Consumption PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
**Secular Equilibrium PRG for Th-232*	*2.95E+01*	*5.61E+05*	*6.03E+00*	-	*5.01E+00*
Ac-228	1.74E+04	2.64E+09	1.77E+01	-	1.76E+01
Bi-212	5.10E+04	1.15E+09	1.45E+02	-	1.44E+02
Pb-212	1.35E+03	2.06E+08	1.67E+02	-	1.49E+02
Po-212	-	-	-	-	-
Po-216	-	-	1.02E+06	-	1.02E+06
Ra-224	2.01E+02	1.15E+07	2.13E+03	-	1.84E+02
Ra-228	4.33E+01	2.97E+06	1.53E+06	-	4.32E+01
Rn-220	-	1.13E+11	2.59E+04	-	2.59E+04
Th-228	3.52E+02	9.80E+05	1.27E+04	-	3.43E+02
Th-232	4.66E+02	3.00E+06	1.57E+05	-	4.64E+02
Tl-208	-	-	1.05E+01	-	1.05E+01

U-238 Decay Chain:

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Produce Consumption PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
**Secular Equilibrium PRG for U-238*	*1.38E+01*	*8.97E+05*	*8.29E+00*	-	*5.18E+00*
At-218	-	-	1.07E+10	-	1.07E+10
Bi-210	3.57E+03	2.85E+08	2.81E+04	-	3.16E+03
Bi-214	2.12E+05	2.10E+09	9.52E+00	-	9.52E+00
Hg-206	-	-	8.26E+09	-	8.26E+09
Pa-234	9.97E+06	6.77E+13	6.84E+03	-	6.83E+03
Pa-234m	-	-	7.87E+02	-	7.87E+02
Pb-210	4.99E+01	8.18E+06	4.74E+04	-	4.98E+01
Pb-214	1.08E+05	1.67E+09	7.44E+01	-	7.44E+01
Po-210	2.61E+01	8.95E+06	1.60E+06	-	2.61E+01
Po-214	-	-	1.88E+05	-	1.88E+05
Po-218	-	9.34E+09	8.56E+09	-	4.47E+09
Ra-226	1.26E+02	4.61E+06	3.39E+03	-	1.22E+02
Rn-218	-	-	1.08E+11	-	1.08E+11
Rn-222	-	5.70E+10	4.18E+04	-	4.18E+04
Th-230	5.15E+02	3.81E+06	7.03E+04	-	5.12E+02
Th-234	1.37E+03	4.22E+09	4.45E+03	-	1.05E+03
Tl-206	-	-	9.55E+09	-	9.55E+09
Tl-210	-	-	2.50E+04	-	2.50E+04
U-234	5.77E+02	4.67E+06	2.11E+05	-	5.75E+02
U-238	6.37E+02	5.49E+06	4.26E+05	-	6.36E+02